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APPENDIX TO THE BRIEF OF PLAINTIFF-APPELLEE

United States Court of Appeals for the Fourth Circuit

No. 7298

SEARS, ROEBUCK & COMPANY AND THE PLYMOUTH RUBBER COMPANY, INC., *Defendants-Appellants*,

v.

MINNESOTA MINING AND MANUFACTURING COMPANY, *Plaintiff-Appellee*

Appeal from the United States District Court for the Middle District of North Carolina Greensboro Division

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EXCERPTS FROM TESTIMONY AND PROCEEDINGS AT THE TRIAL

The above-entitled causes, having been consolidated for the purposes of trial, pursuant to Order of Court dated January 7, 1955, came on to be heard before The Honorable

Johnson J. Hayes, United States District Judge, at Greensboro, North Carolina, on November 1, 1955, when and where the following proceedings, among others, were had.

• • • • • • • • • • •

Excerpts from Defendant's Opening Statement

23 *** I won't discuss the validity of this original patent. They did a very good technical job in putting these plasticizers together, and getting an excellent product. Well now, what happened? I don't know why they weren't able to use G-25 satisfactorily, whether their technique was wrong. We always have a lot of trouble with it, or what happened. They weren't able to.

• • • • • • • • • • •

Plaintiff's witness **Hubert James Tierney.**

Direct Examination

By Mr. Lawrence C. Kingsland:

42 Q. Will you state what your present occupation is?

A. I am presently employed by the Minnesota Mining & Manufacturing Company.

Q. What was your formal education, Mr. Tierney? A. I received the degree of Bachelor of Science in Chemical Engineering offered by the University of Minnesota.

Q. When did you first become connected with the plaintiff in this case, that is, the Minnesota Mining & Manufacturing Company? A. I first entered the employment of Minnesota Mining & Manufacturing Company in 1927, in June of that year.

• • • • • • • • • • •

44 There are over three hundred standard pressure-sensitive adhesive tapes that our firm makes, and since 1931, and even since 1927, as I made reference to

earlier, I have been interested in the research and development problems of all the various types. From 1931 to 1934 constituted the period when I was charged with the responsibility of research and further development of the Cellophane and transparent non-fibrous film-back type of
45 pressure-sensitized adhesive tapes, such as the SCOTCH brand transparent Cellophane tapes.

• • • • • • • • • •

I was chief chemist from 1934 until 1943, at which time I was made tape products manager. That included additional responsibilities on the quality-control part of the production of all the different types of tape that our company manufactured. I was tape products manager from 1943 until 1948, at which time I was made manufacturing manager of the tape division of our company, and I was manufacturing manager from 1948 until 1952, at which time I was made a vice-president of the corporation and placed in charge of all tape research development and tape manufacturing of Minnesota Mining & Manufacturing Company.

Q. Mr. Tierney, have you had occasion to testify at any other time in patent cases; if so, what? A. Yes, I have testified in the patent infringement suit involving the Cellophane tape patent, that is, the Drew 2,177,627 patent
46 that was in the Seventh Federal Circuit in Chicago in 1945. I testified again in a different case involving that same patent in 1946. I testified in a different infringement suit concerning that same patent in the Second Federal Circuit in New York a little less than one year ago. That suit was Minnesota Mining & Manufacturing Company versus Technical Tape Corporation. I believe I left out that I also testified in a further suit on the Drew 2,177,627 patent in Chicago in 1952. That was Three-M

Company, or Minnesota Mining & Manufacturing Company, versus Neisner Brothers.

Q. Mr. Tierney, will you state generally what preparation you made to testify in this particular case? A. I have carefully studied the Oace, et al., reissue patent. I have reviewed the experimental work of the patentees, Oace, Esther LePage and Snell. I have studied the eleven U. S. patents and the one foreign patent, the Swiss Bierbrauer patent, and the twenty or more publications that have been cited by the defendant in this proceeding. I have also had a number of different examples of tape made in accordance with the Oace patent and have also had other samples prepared in connection with this proceedings.

47 Q. In your present activities, have you, yourself, at any time had occasion to try to make a pressure-sensitive tape on a vinyl film backing? A. Yes, I have.

Q. Will you recount your experiences in that connection? A. I can recall specifically that in 1938 I made a number of attempts to make a satisfactory vinyl film-back pressure-sensitive adhesive tape. At that time I attempted to utilize the plasticized vinyl chloride film backing made by B. F. Goodrich Company and merchandised under their brand name of KOROSEAL. I believe I may have made earlier efforts to utilized transparent vinyl film backings for pressure-sensitive adhesive tapes than then, even 1938. I remember the experiments with reference to KOROSEAL very specifically. All attempts were unsatisfactory. The pressure-sensitive adhesives became very soft and gooey and pasty and in any attempt to unwind the rolls the adhesive split, leaving half of the adhesive on the back side of the underlying layer of backing.

Q. Did you form any opinion as to why it was difficult

to make a commercially successful pressure-sensitive tape at that time; I mean the reason for your failure? A. Yes. Polyvinyl chloride resin itself is a very hard, brittle and non-elastic thermoplastic resin. The polyvinyl resins were known as early as the eighteen hundreds and a number of references in the literature have appeared with respect to these resins. They did not, however, come into very widespread commercial utilization until the 1920's and 30's, at which time they began to be utilized as substitutes for rubber, because these hard, inelastic resins, when they are plasticized as they were at that time, they develop flexible properties that made them suitable as a replacement for many of the places where rubber had formerly been utilized. These plasticized vinyl resins, however, as they were being made in the 20's and 30's, when attempts were made to coat pressure-sensitive adhesives on such plasticized films many difficulties were encountered. The difficulties were, namely, the same as those I have described with reference to my own experience: The pressure-sensitive adhesives absorbed the migratable, oily type plasticizers that were then used to plasticize the polyvinyl chloride, or vinyl chloride-vinyl acetate copolymer resin, and in the process of being added to the pressure-sensitive adhesive they spoiled the original character of the pressure-sensitive adhesives.

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Q. Prior to the time that the inventors in suit succeeded in producing this type of tape, did any other researchers connected with your organization have occasion to experiment in connection with the production of such a tape? A. Yes. Warren Hurd, who was a chemical engineer in our laboratory at that time, attempted to make stretchable vinyl-film backed inner-sole bonding tape, namely, a stretchable pressure-sensitive adhesive-coated

49

tape that was aimed at utilization in the shoe industry for bonding the edges of inner soles. His attempts also were a failure and all experimental lots, which constituted quite a number of different attempts that he made, were unsatisfactory, because the pressure-sensitive adhesive became soft and pasty and with very short age, and the tape was so gooey and sticky as to be non-usable for his original purpose.

Q. Were you familiar with the work that was done by Ralph J. Oace and his co-inventors to make the pressure-sensitive stretchable and retractable insulating tape? A. Yes, I was very familiar with his work and that of the rest of the team that was working with him on that problem.

Q. In the first place, who was Mr. Oace? A. Ralph Oace is a graduate chemical engineer from the University of Minnesota. He entered our employ, that is, the tape laboratory of Minnesota Mining & Manufacturing Company, in 1937. He is currently employed, so that he's worked with our company continuously since that time. From 1941 to the latter part of 1945 he was in charge of electrical products section of the tape research laboratory of our firm.

Q. So he was in that employ in 1944 and 1945, that is to say, the electric tape laboratory? A. Yes, even before that time, from 1941 up to the latter part of 1945.

Q. Now I wish you would tell us something about the knowledge you have of the efforts that were made by Oace and his co-inventors in the development of this pressure-sensitive stretchable and retractable insulating tape. A. We had wanted to make a stretchable plastic film-backed tape for quite some time. In the latter part of 1943 and 1944 it was a very active project on our research program.

Ralph Oace was in charge of that project, which was, namely, to attempt to develop a stretchable and retractable electrical insulating pressure-sensitive adhesive tape. In the course of his work Miss Esther Eastwold, who is the present Mrs. LePage, also collaborated with him on that project. She was employed in a different laboratory, namely our central research laboratories, but she investigated
51 and did a great deal of work in connection with that problem or project and worked closely with Mr. Oace. In June of 1944 Mr. Robert Snell completed the rest of that project team in working toward that objective of attempting to develop that type of pressure-sensitive adhesive tape.

* * * * * * * * * *

They investigated a great number of different plastic materials, synthetic polymeric materials, which included nylon and various types of polyvinyl resins. They investigated a great many different plasticizers and blends of those plasticizers, made numerous experiments on combining and sheeting out film backings of such compositions and then priming them and coating them with a number of different types of pressure-sensitive adhesives. They were investigated through the slitting departments, tested for electrical insulating performance, aging life, in fact, the whole list of tests that would be necessary to indicate whether such compositions as they had developed would age satisfactorily to provide the long-aging type of stretchable and retractable pressure-sensitive adhesive insulating tape.

Q. Can you put an approximate number on the experiments that were conducted before they reached the solution of this problem? * * * A. I know there were well
52 over two hundred individual and different experiments.

Q. At about what time did they reach a successful solution of this problem they were working on; do you remember about the date? A. Yes, they obtained a successful conclusion and solution to that project or problem in October of 1944 .

Q. Will you tell us briefly how that first tape of this type was made? A. The tape was made with a pliable and stretchable plasticized polyvinyl chloride-vinyl acetate film backing; in other words, they utilized a vinyl chloride-vinyl acetate copolymer resin, namely, VYNS. That resin was plasticized with a non-volatile, non-migrating plasticizer comprising Paraplex G-25 and dioctyl phthalate. The film backing was primed and coated with a pressure-sensitive adhesive.

53 Q. I understand this tape was later made commercially; is that correct? A. Yes, it was. It was sold in 1945 and formulations substantially the same as that have been sold continuously up to the present time.

• • • • • • • • • • •

54 Q. Mr. Tierney, just before adjournment we were speaking of sales in 1945 of this tape. Do you know the approximate dollar value of sales during that first year? A. Yes, the approximate dollar value of that tape that was sold in the year 1945 was $10,000.00.

• • • • • • • • • • •

55 The general practice previous to the Oace inven-
56 tion was to use the only insulating tapes available at that time, for insulating the splice. These tapes were the ordinary rubber electricians' tape and the friction tape. The splice was first wrapped with the rubber insulating tape, and then over-covered or over-wrapped with friction tape or bicycle tape as some of us might recall it.

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65 . . . . I'll demonstrate the prior practice, which would be to take off a piece of the rubber electricians' tape anywhere from six to eight inches in length. The electrician would first have to pull off the Holland cloth liner, and you will notice that as I just removed the Holland cloth liner, there was a threaded piece of the liner left on the electrical tape, which the elctrician would remove because otherwise, since that coating is starched, if moisture is present it would yield a conductive portion which would be undesirable on the splice. He would then take the piece and leave about a quarter of an inch beyond the end of the twisted copper portion, fold the electricians' tape
66 together, and then pulling the tape and stretching, wrap it spirally around the wire. He would next take a piece of friction tape of approximately the same length in order to yield the overwrap. As I mentioned before, the purpose of the friction tape is to yield mechanical protection to the splice. In using the product of the Oace patent, the same length piece, six to eight inches would be removed, and the piece applied, leaving about the same length beyond the twisted copper wire. Then twisting and stretching the tape around the twisted wire with just a single piece of tape, would leave noticeably a much smaller spliced portion with this one piece of tape. Now, that splice satisfies the electrical codes. A licensed electrician, in order to obey the codes, is required to use a rubber electricians tape and the overwrap of the friction tape. With the patented tape of the Oace patent, the single plastic tape wrapping satisfies the code. It lends both the adequate electrical insulation protection as well as the protection mechanically against abrasion.

* * * * * * * * * *

68 The rubber electricians' tape has a dielectric strength of about 350 volts per mil, that is, per thou-

sandths of an inch. The Oace patented tape, or the SCOTCH No. 33 patented electrical tape, has a dielectric strength of from 1200 to 1500 volts per mil. In other words, the plastic electrical tape, Exhibit T-4-A, is in the range of three and a half to four times as good in electrical dielectric insulating strength as the rubber electricians' tape. The dielectric strength of the friction tape is very low; it's in the range of 70 to 80 volts per mil. In other words, that small, thin, and much less bulky spliced portion that has been wrapped with the plastic tape is actually a higher and better insulated splice than even the big, bulky one there, and it remains the better insulated splice if both of those spliced pieces were to be left exposed to sunlight, rain, sleet for any appreciable time, outdoor exposure, for example.

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71 Q. Was there ever any effort made by Minnesota Mining & Manufacturing Company to adopt the Schmidt disclosure for use as a splicing tape to insulate electrical joints, or to test it for that purpose? A. Yes, examples of the Schmidt patent were made and were evaluated as an electrical insulating tape.

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73 The Court: While he is discussing that Schmidt patent, what do you understand claim 2 in that patent to mean with respect to the explanation you have just been giving, claim 2 and 3?

The Witness: Claim 2 refers to a plasticized polymer. Exhibit 6 was merely introduced to allow Your Honor to appreciate the physical effect produced by using the amount of plasticizer referred to in the Schimdt patent. I

74 think it will all be cleared up with the showing you of Exhibit No. 7, which is the one which is plasticized with the maximum quantity of plasticizer as referred to in

the Schmidt patent. In other words, Schmidt warns very specifically against going beyond 20 parts of plasticizer per one hundred parts of the vinyl resin, and the Exhibit T-7, which I now have in my hand, will, I think, clarify that. This film is the VYNS vinyl resin that has 20 parts of plasticizer, namely, the maximum amount of plasticizer referred to by Schmidt. Schmidt says, don't dare go beyond 20 parts, because you will be getting beyond what I am talking about. Now the purpose of showing this is to show that even with 20 parts a film that is still relatively stiff and rigid is obtained. It is not the soft, pliable, stretchable and elastic type of film such as the Oace patent is concerned with and requires in yielding the product that is valuable in the electrical insulating industry.

The other thing that is pertinent in the Schmidt patent is that while he says on page 1, column 2, in line 4, "In general, thicknesses of .001 to .004 inch or more are satisfactory," his preferred example, you will notice, is given at the lower part of page 1, starting with line 49, and that

preferred example uses a backing containing 100
75 parts of gamma polyvinyl chloride, 5 parts of dioctyl phthalate, and 2 parts of the monoester consisting of glycerine and cottonseed fatty acid.

In other words, there is only 7 parts of plasticizer that he used in his preferred example, but we just saw how brittle and stiff the maximum amount of 20 parts, the physical character that it gave to the vinyl film.

Now the next pertinent thing about the Schmidt preferred example is given on page 2, column 1, line 1, where it says: "The transparent film produced is about .002 inch thick as stripped from the drum before the completion of its revolution." In other words, while Schmidt talks about films that are from 1 to 4 mils, or .001 inch to .004 inch

thick, his preferred example is only 2 mils thick, and he's concerned about a transparent product. So it's quite obvious that what he is thinking about there is a product similar to the cellulose acetate pressure-sensitive adhesive tape, or the Cellophane types, which are not the stretchable, elastic type and are so thin that, if used for electrical purposes, they would not yield the high dielectric strength as given by the Oace product in thicknesses of 4 to 20 mils thickness.

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76 Q. Mr. Tierney, do you find in the Schmidt patent any disclosure whatever that concerns electrical insulation? A. No, there is nothing mentioned in that patent toward that end objective.

The Court: What do you suppose is meant by what is said on page 2, column 1, beginning with line 12 and ending with 16?

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The Witness: Yes, I have it, sir. That merely specifies the physical character of the tape resulting from
77 the quality of the rigid polyvinyl chloride material proper.

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86 A. You will see that the Exhibit (T-13) illustrates the offsetting of the gooey, sticky adhesive onto the back side of the underlying convolutions in unwinding the roll. The originally firm pressure-sensitive adhesive has become physically soft and gooey and stringy or pasty, and where that section of the patent, Column 2, Line 39, that is, of the Oace patent reissue 23,843 refers to pasty, this Exhibit properly illustrates that pasty condition of adhesive that is obtained when the liquid type plasti-
87 cizers that have been used to the amount of from 30 to 40 parts of 100 parts of the vinyl resin film,

that when pressure-sensitive adhesives are coated on such dioctyl phthalate plasticized films, the adhesives absorb the oily type of dioctyl phthalate plasticizer and in the process becomes soft and gooey.

Q. Now Mr. Tierney, disregarding the question of the pe tiness, the soft and gooey feature, does it have the stretchability feature? A. Yes.

Q. And it has flexibility, obviously? A. Yes, it's very evident that this film (T-13) has the physical attributes of stretchiness and retractability, but it has failed in the respect that there is not perfect equilibrium obtained. The plasticizer, the liquid type plasticizer has migrated from the backing into the adhesive, making it very soft and gooey, and valueless.

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89 . . . So the way Schmidt is going to avoid the difficulties that others have found in attempting to put a pressure sensitive adhesive on a soft pliable flexible and stretchable plasticized polyvinyl film backing, is first of all not to use any more than 20 parts and then finally to use a special type of pressure sensitive adhesive which he recommends, . . .

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90 Q. To your knowledge, has any film constructed
91 according to the full teachings of the Schmidt patent, ever reached the commercial world? A. To my knowledge, no tape of the Schmidt patent type has ever been commercially sold in the United States.

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96 The patent there points out (col. 3, l. 20) that to achieve the desired degree of stretchiness in the plasticized vinyl resin film a combination of modifiers

is recommended, a liquid low molecular weight modifier along with a high molecular weight modifier. They mention one low molecular weight liquid plasticizer, such as dioctyl phthalate, and they mention Paraplex G-25 as an example of the high molecular weight plasticizer.

* * * * * * * * * *

97 Q. Now, Mr. Tierney, when you blend together 20 parts, for example of dioctyl phthalate, which we have referred to as the DOP, with an equal or greater weight of the G-25, as referred to in the portion that you have read from the patent, what is the general nature of that plasticizer material? A. It is a liquid non-volatile plasticizer; it's a resinuous plasticizing liquid.

98 Q. Is it less viscous than the Paraplex G-25 alone would be without the addition of this DOP? A. Yes, it is less viscous and more fluid than the separate Paraplex G-25 alone.

* * * * * * * * * *

102 Ethyl acrylate polymer, or ethyl acrylate polymerized resin, is a blend of a number of different molecular weights of the ethyl acrylate unit. It has two, five, twenty, or thirty units of the ethyl acrylate monomer, or it can have eighty to a hundred or more. The composition that it has is controllable by the organic chemist, the polymerization chemist; he tailors it to produce the ethyl acrylate polymer resin of the properties that he wants for the purposes involved.

* * * * * * * * * *

103 Q. Well, can a viscous liquid polymerized ethyl acrylate be divided into a low molecular-weight fraction and a high-molecular-weight fraction? A. Yes, very definitely you can fractionate the polymerized resin into

a low-molecular-weight liquid fraction and into a higher-molecular-weight liquid fraction, more viscous resinous fraction.

Q. Well, is it correct to characterize it as a blend of the lower-molecular-weight and the higher-molecular-weight materials forming a single plasticizing material; that is, I am speaking, of course, of this polymer, ethyl acrylate. A. Yes, it is proper to refer to the ethyl acrylate polymerized resin, as it is referred to in this patent, as the blend of low-molecular-weight liquid material along with higher-molecular-weight viscous resinous ethyl acrylate.

* * * * * * * * * * *

104 Q. Am I to understand you increased the amount of the polymerized ethyl acrylate to the point that you used it as the sole plasticizing material in some of the tapes you have made?

105 A. Yes, sir, I followed the instructions in column 5 that I have referred to earlier and I made samples of stretchable plastic tape wherein the ethyl acrylate polymerized resin was used in greater amounts than the Paraplex G-25, and, namely, to the extent where it was used as the sole plasticizer.

Q. How did you proportion it with the vinyl polymer? A. The formula was 100 parts of VYNS vinyl copolymer resin, 50 parts by weight of ethyl acrylate polymer resin.

Q. I wish you would produce the sample of the 50 part ethyl acrylate and the 100 part VYNS, that is, the vinyl copolymer material; if you have it here, produce it, please, and make an explanation of its characteristics? By the way, in order to keep the record straight, I would like to identify this at this point as Tierney Exhibit 14, so that you can refer to it as that and keep it straight. A. The roll

of tape I now hold in my hand represents that tape to which I have just been referring. It is Plaintiff's Exhibit No. T-14, namely, the backing where the vinyl resin was the 100 parts VYNS combined with 50 p rts of the ethyl acrylate resin. You will notice that the tape is stretchy, that is is soft, pliable, conformable; that pressure-sensitive adhesive that has been coated on it has no tendency to offset to the

106 underlying layer in unwinding; that the tape has aggressive adhesive character; that it can be applied to smooth surfaces and it will adhere, removed therefrom and leave no residue. Now that film backing was 100 parts of the VYNS resin, 50 parts of the ethyl acrylate polymer resin, 3.6 parts of calcium stearate. It was blended and milled according to the method described in the patent in Example 1, in column 6. It was sheeted to a 4-mil thickness. The backing was primed with a primer described in Example No. 2, and it was coated with the pressure-sensitive adhesive described in Example No. 2 of the Oace patent. It is a stretchable and retractable electrical insulating tape. It was tested for its electrical insulating character, and found to have a dielectric strength of over one thousand volts per mil. You will recall that the rubber electrician's tape has only 350 volts per mil and the friction tape only about 80 volts per mil.

Q. Was it tested for its aging characteristics? A. Yes, it was, and it is a stable, long-aging type of stretchable pressure-sensitive plastic film backing electrical insulating tape, that is, where the adhesive is in permanent equilibrium with the backing.

* * * * * * * * * *

107 A. Yes. That section, starting with line 45 and ending at line 64, refers to the fact that the resinous or high-molecular-weight modifiers, such as the Paraplex G-25, are capable of producing the desired degree of stretch and

elasticity in the vinyl chloride polymer films, and, furthermore, that they are generally classified as non-migrating or permanent type modifiers or plasticizers; however, that it is surprisingly found that the material such as G-25 does not provide for permanent equilibrium of adhesives and backing, as was defined earlier in column 3 of this patent, and that when tapes were made of the vinyl polymer and such Paraplex G-25 resinous modifier and coated with pressure-sensitive adhesives, that they had a tendency to lose a great deal, if not all, of their initial tackiness or pressure-sensitivity and that when tape made that way was un-

108 wound from roll form after only a moderate period of storage it did not adhere, because of this loss of the pressure-sensitive adhesiveness, or the loss of tack that is referred to there.

• • • • • • • • • • •

A. I believe the patent there refers to what the experience of Oace, Eastwold and Snell was as of that period of time with the Paraplex G-25 of that vintage, namely, 1944, 1945.

Q. Were you acquainted with the results that are stated in that portion of the specification at the time this work was done by those inventors or by those researchers? A. Yes, I was.

109 Q. And it is accurately stated, according to your memory? A. It accurately states what the experience of the three patentees was with reference to the use of the Paraplex G-25, as it was made and composed and sold at that time by the Resinous Products & Chemical Corporation, which was the subsidiary of Rohm & Haas.

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111 . . . . Sir, that was not the bad condition that was obtained with the use of the Paraplex G-25 as to a

plasticizer at that period, in '44 and '45. The bad result that was obtained was the pressure-sensitive adhesive lost its adhesive aggressiveness within one or two days.

Q. As distinguished from becoming pasty? A. Yes. Now, with the use of Paraplex G-25 as it has been made and furnished to the trade in the last two years or
112 three years, that same result has not been obtained. A pressure-sensitive adhesive and retractable insulating tape of satisfactory aging life is obtained with the use of Paraplex G-25 of recent vintage, that is, as it has been made within the last two or three years. There is nowhere that same amount of tack-killing or adhesion loss obtained with the Paraplex G-25 plasticizer of recent vintage. It is true that there is still a relatively small amount of tack loss when Paraplex G-25 of recent vintage is utilized as the sole plasticizer. Better results are still obtained today with Paraplex G-25 of recent vintage when a small amount of the DOP or dioctyl phthalate is added to its as the plasticizing ingredient.

Q. Does the patent indicate generally the chemical nature of the product that's sold under the trade designation of Paraplex G-25? A. Yes, that is indicated in column 5, line 26 to line 30, where it indicates that it is the reaction product of sebacic acid with glycol, or polyhydric alcohol.

Q. How would you describe the general characteristics of that material? What kind of material is it? A. It is a liquid viscous resinous material.

Q. Does it have a varying molecular weight? A. Yes, it is composed of a range of varying molecular weights.

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118 Q. Now, as a practical matter, has the commercial product of your company generally responded to

those properties that we have just discussed? A. All of the plastic pressure-sensitive insulating tape that has been manufactured and sold by Minnesota Mining and Manufacturing Company fully answers those specifications or those characteristics that we just referred to.

* * * * * * * * * * *

123 . . . It (col. 4, l. 63) indicates that in that instance, with that particular copolymer resin the vinyl chloride is in the proportion ratio of 95 parts to 5 parts of the vinyl acetate, and in that same section it indicates that the polyvinyl chloride itself, that is, in the ratio of 100 parts to zero parts of the vinyl acetate, is satisfactory.

Q. I suppose what you are referring to is that language which says "Vinyl chloride itself is satisfactory in many formulations"? A. Yes. That is line 65 to 67, column 4 of the patent.

Q. Now has your company ever made and sold commercially a product, that is, a plastic tape of the type we are discussing, with a backing material made of straight vinyl chloride polymer, suitably plasticized, that is, other than the copolymer? A. Yes, we have made and sold a considerable amount of such stretchable insulating pressure-sensitive adhesive tape.

Q. And you have found that to be a satisfactory commercial product? A. Yes.

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124 A. That paragraph (1st of col. 5) refers to the fact that other liquid plasticizers, other than the dioctyl phthalate, may be utilized; however, that the plasticizer must be compatible with the vinyl polymer and that it should be low in volatility; that is, that it should not evaporate over a period of time; and, by being compatible, it is

required that the plasticizer shall be homogeneously incorporated with the vinyl resin; it should not spew out or exude onto the surface of the plasticized vinyl film; and that, in addition, that low volatility is an important point so that the plasticizer will not be driven off during the milling and the calendering, because those two manufacturing operations are conducted at high temperature, namely, temperatures of from 250 degrees F. up to, and in some cases, 320 degrees F. It indicates some liquid plasticizers, such as tricresyl phosphate, dioctyl phthalate, that are alternate materials for the DOP. It also indicates in line 11 to line 15, column 5, that all of those compounds such as the ones specifically mentioned are capable of producing pastiness in the water-insoluble, pressure-sensitive type adhesives that are coated on the vinyl backings which are plasticized with those specific liquid plasticizers mentioned in that paragraph, if those liquid plasticizers are used in proportions greater than about 20 parts per hundred
125 parts of the vinyl polymer.

Q. Now, taking the first sentence of the next paragraph that begins in line 16, this reads: "Likewise, various compatible non-migrating resinous or high molecular weight modifying materials having a plasticizing effect on the vinyl polymer employed may be substituted in whole or in part for the specific alkyd resin hereinbefore mentioned." What is, in your interpretation, the specific alkyd resin that's been mentioned? A. The specific alkyd resin that's been mentioned in the patent prior to this section is the Paraplex G-25.

Q. What is the significance of the statement that I have read to you? A. The patent states that various other compatible, non-migrating resins or high-molecular-weight materials that have a plasticizing effect on the vinyl poly-

mer may be substituted in whole or in part for the specific alkyd resin, namely, the Paraplex G-25 that was mentioned earlier.

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134 A. Yes, Minnesota Mining and Manufacturing Company has sold a considerable quantity of stretchable pressure-sensitive insulating tape that corresponds essentially to example 1, with the exception that instead of using the specific primer of the example 1, the greatest majority of all of the plastic tape sold by Three M company has utilized a primer essentially the same as the primer that is specified in example 2 of the patent, and the last exception is that the greatest majority of the plastic tape has been sold by Three M Company, has been of the black backing or the same as the plasticized film of example 1 of the patent except for the fact that .5 parts of carbon
135 black were added to the 100 parts of the VYNS resin.

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143 Q. Now I think generally we've covered the patent. I have some other questions now. Has the material that is sold by Rohm & Haas, and was sold by them under the trade designation of Paraplex G-25, undergone any observable change over the years, that is, from the time it was first brought to the attention of your company? A. Yes it has. In 1944 to 1945 the Paraplex G-25 that we received, had a film of oil on the surface of the containers, and the Paraplex G-25 which we have received in recent years, has had no such liquid oil on the surface of the containers as we receive it from Rohm & Haas Co.

Q. Now is there any other difference between the recent supply of this Paraplex G-25 as compared with that furnished to your company by Rohm & Haas in the year 1945?

A. Yes, the observable difference that today when we utilize the current vintage type of Paraplex G-25, we can make a satisfactory stretchable and retractable pressure-sensitive adhesive tape, with it as the sole plasticizer. We had no success in doing that in the period 1944 and 1945 because

144 such tape as was made with the Paraplex G-25 of that vintage, lost its pressure-sensitive adhesiveness within one or two days after the tape was made. The present Paraplex G-25, while it shows some loss of adhesiveness, it's nowhere near of the same order. The amount of pressure-sensitive adhesiveness that is left with the tape made with the Paraplex G-25 of current vintage, is sufficient for adequate splicing and adhesion for many months. Now, I indicated before, I believe, that a superior tape is still made if some dioctyl phthalate is added to the Paraplex G-25 of current vintage, to provide a non-migrating plasticizer for the vinyl polymer resin in making the stretchable and retractable electrical insulating tape of the patent.

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149 If the specification range of Paraplex G-25 were to be narrowed, that is, if the viscosity range of it were to be narrowed, in my opinion that would signify that they had produced a more narrow controlled range of molecular weight material. If a resin has too high a molecular weight, that is, if the molecule is too large, it is very difficult to squeeze it into the vinyl resin and have it act as a plasticizer, by the sheer virtue of its being too large, . . .

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151 A. In my opinion, if the higher-molecular-weight portions were removed, the Paraplex G-25 would be a more satisfactory plasticizer for the vinyl resin. There would be less tendency for any of the higher-molecular-

weight material to exude on the surface of the viynl film. The elimination of the portions that were of higher molecular weight would minimize that tendency, or, in other words, would make for a more homogeneously incorporated plasticizer, one that would have less tendency to exude or spew out.

Q. In the years 1944-1945 did representatives of Rohm of Rohm & Haas Company call on your company in connection with business matters? A. Yes, they did. Dr. Fred Meyers and Mr. Martin Bretl called on us at that time and have continued to call on us up to the present time.

Q. In the years 1944-1945 were representatives of Rohm & Haas acquainted with your problems in development work? A. They knew that we were attempting to use their material as a plasticizer for vinyl resin in the manufacture of a stretchable pressure-sensitive adhesive tape.

Q. Were you at that time informed by any of the representatives of Rohm & Haas that they did have processes and means for controlling the molecular weight of
152 their polymeric resinous products such as Paraplex G-25? A. Yes. Dr. Meyers so indicated at that time.

Q. Did this relationship between your company and Rohm & Haas continue; that is, did they continue to call on you throughout the years following the period that we are interested in? A. Yes, those two same representatives, along with others, have frequently called on Minnesota Mining and discussed the performance of their products in the manufacture of our products in which we used their materials.

Q. During that period did you discuss your problem with any other organization other than Rohm & Haas? A. Yes,

I discussed the subject with Bakelite Corporation, which is a subsidiary of Carbide and Carbon Chemical Corporation.

Q. Do you recall any individuals that were associated with that company, the Bakelite Company, that those discussions were had with? A. Yes, sir, I remember specifically a discussion I had with Mr. Intemann in New York City in 1945; Mr. Arnie Sward was also present in that discussion.

Q. Was there any disclosure made of the formulation of the backing to the Bakelite Company or to others, as of the period about the time the application was filed?

153 A. Yes, we disclosed our formulation for making the plasticized stretchable and retractable vinyl resin film that performed satisfactorily in making the pressure-sensitive insulating tape of the Oace patent. That formula was disclosed to Bakelite Corporation by Dr. W. E. Lundquist in March of 1946.

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156 Q. Did the Bakelite Company ever produce films for your company in general accordance with the formula? A. Yes, they did. They produced quite a few thousand square yards of plasticized vinyl resin film

157 in accordance with the formula which we gave to them and asked them to use in making such film for us.

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159 The Court: If I understood you correctly, in this product sold under the number 33, SCOTCH brand, the volume was in excess of eight million square yards?

The Witness: Yes.

The Court: And that constituted about fifty per cent of your product?

The Witness Yes, fifty-seven per cent of all our—

The Court: Fifty-seven?

The Witness: Yes.

The Court: Then your product under sale number 22, as I understood you, that embraced something in excess of three million square yards?

The Witness: Yes.

The Court: Do you have the percentage there?

The Witness: Yes.

The Court: What is it?

The Witness: The combination of those two types—

The Court: I mean on number 22. What is the percentage of your volume?

The Witness: Oh, twenty-three per cent of the total volume of tape.

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163 Q. Mr. Tierney, at lunch, it was suggested that your answer with respect to where you found the oil on the Paraplex G-25, that is, that you got around 1944 and 1945, will you make a statement of what the fact is? A. The fact is that the layer of liquid oil was on top of the Paraplex G-25 itself.

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165 Q. Now before you testify in regard to that, I would like to give it a number, Exhibit 17 for identification. T-17. What is the ratio in this blend of the G-25 and dioctyl phthalate? A. The ratio in this blend of liquid resinous plasticizer for the G-25, is 2 parts to 1 part of the DOP. In other words, this plasticizer represents the plasticizer of example 1 of the patent wherein there is the 200 parts of Paraplex G-25 and 100 parts of dioctyl phthalate.

Q. What is the nature of the material? Can you demonstrate it? A. It is a soft viscous resin liquid in character.

The Court: To the ordinary observer it looks like mucilage. A. Yes, sir. It is a non-volatile plasticizer, non-migrating plasticizer.

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166 Q. Now, taking this blend of the material that you just spoke of, how does it function as a plasticizer? A. It functions in purely a physical sense in making the hard, horny, non-elastic vinyl resin or vinyl copolymer resin soft, pliable, flexible, stretchable and elastic.

The Court: What about retractable. A. And retractable also.

Q. Now Mr. Tierney, have you an example of the material known as the polymerized ethyl acrylate? A. Yes I do.

Q. All right, the bottle that is before you, I ask to be identified as Exhibit T-18. Now, what's the nature of this material? A. This is a soft viscous resinous ma-
167 terial, somewhat more viscous than the Exhibit 17 that I just talked about. It is a high molecular weight resinous material.

Q. Well, how does its physical characteristics compare with a plasticizer of the material that is contained in Exhibit 17, which was the G-25 plus the DOP? A. It is a liquid material, somewhat more viscous in character than Plaintiff's Exhibit T-17.

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Q. Now how does this polymerized ethyl acrylate (Ex. T-18) function in making the tape of the Oace patent? A. The polymerized ethyl acrylate resin also functions in purely a physical sense in making the hard brittle vinyl polymer resin soft and pliable, elastic, stretchable and retractable.

Q. If you recall, we entered those as T-14, a tape that was made as I understand it, with the polymerized ethyl acrylate. Was it a material such as is exemplified by what is contained in this bottle, T-18, the material with which that was made? A. Yes it was. Exhibit T-14 represents the tape which was made with the ethyl acrylate polymerized resin of Exhibit T-18, where 50 parts of that polymerized ethyl acrylate resin of the same material in Exhibit T-18, was used to plasticize 100 parts of VYNS vinyl copolymer resin.

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170 A. The Paraplex G-40 resinous plasticizer also functions in a purely physical sense in making the hard, brittle vinyl resin soft, pliable, stretchable and retractable. There is, in other words, no chemical sort of reaction involved in achieving that plasticizing of the vinyl resin.

171 In making the tape, Exhibit 19, where the Paraplex G-40 was used as the sole plasticizer, the same procedure was followed as was referred to in the Oace patent, except for the substitution of the Paraplex G-40; the same mixing equipment and milling and calendering procedures were utilized and the same result was obtained; that is, the finished plastic electrical tape obtained, Exhibit T-19, was indistinguishable from the Oace product, from the Exhibit T-4-A.

Q. Now have you a sample of the tape that was made with the G-25 of the current production, that is, of the current vintage, as the sole plasticizer? A. Yes, I do.

Q. I believe that is identified as Exhibit T-21 and so marked? A. Yes, it is. The roll of tape I now hold in my hand, Exhibit T-21, represents the stretchable plastic in-

sulating tape where Paraplex G-25 has been used as the sole plasticizer, that is, the Paraplex G-25 of current vintage. It was used to the extent of 50 parts of the Paraplex G-25 to 100 parts of the Vinylite VYNS copolymer resin, along with the 3.6 parts of calcium stearate stabilizer and the .7 parts of carbon black.

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172 Q. How does this tape that you have before you now compare in physical characteristics with the other tapes we have been discussing? A. It has the same physical characteristics. It is stretchable, pliable and retractable. The pressure-sensitive adhesive remains in permanent equilibrium with the backing. The tape is a high quality, high dielectric strength electrical insulating tape. The tape is indistinguishable from the other examples of tape so far introduced. The electrician could not tell that tape apart from Exhibits T-4-A, T-14, T-19.

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173 A. Yes. The bottle sample that I now have in front of me represents G-25 of current vintage? It is Exhibit T-22.

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Q. Can you indicate the characteristics of it as to viscosity and so forth? A. It is a liquid, viscous resin. As I turn the bottle on its side, you will notice that its viscosity is somewhat higher than the viscosity of the Paraplex G-40, but it is liquid and viscous and it is resinous.

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A. The Paraplex G-25 in Exhibit T-21 functions in the same manner, namely, the same physical sense, in
174 making the hard, brittle vinyl copolymer resin soft, pliable, stretchable and elastically retractable. The

pressure-sensitive insulating tape of Exhibit T-21, from a critical standpoint, might be stated as not quite the same in quality of retaining pressure-sensitive adhesiveness upon aging, as I believe I made reference to earlier in my testimony, that there was still more of a tendency for losing some of the pressure-sensitive adhesiveness with the G-25 than with the plasticizer of Example 1 of the patent, or than with the G-40 plasticizer, for example. However, that amount of loss of pressure-sensitive adhesiveness was in no wise near the amount that was recognized in the use of the Paraplex G-25 of 1944 or 1945 vintage, where pressure-sensitive adhesiveness was completely killed in a matter of only one or two days. Tape of Exhibit T-21 will retain adequate pressure-sensitivity for a period of a year and be suitable for making satisfactory splices by the electricians in the trade.

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175 Q. Now, Mr. Tierney, in summary, you have talked about these four different plasticizers and talked about the tapes made respectively of each (G-40 tape, Exhibit T-19; G-25 and DOP tape, Exhibit T-4-A; ethyl acrylate tape, Exhibit T-14; and current vintage G-25 tape, Exhibit T-21). Will you, just in a general way, compare them? A. They are the same tape, and would be recognized by the electrician as the same tape. All four of them have the same physical quality of stretchability and retractability. On all four of the examples the pressure-sensitive adhesive remains in permanent equilibrium with the backing. All four of the tapes are high quality, high dielectric

insulating strength tapes. They are all four electrical insulating tapes.

Q. Now there has been some discussion about this dioctyl phthalate, or known as DOP for short. Have you a sample of that material? A. Yes. The bottle sample now in front of me, marked Exhibit T-23 is DOP, or dioctyl phthaalte. As I turn the bottle on the side, you will see that it is a relatively fluid material, having about the consistency of a liquid mineral oil, Nujol, somewhat more viscous than water, but relatively less viscous by a good deal than the Paraplex G-40 or the Paraplex G-25.

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176 Q. Have you analyzed this G-25, current G-25, to determine the range of molecular weights? A. Yes, I have had such current-vintage Paraplex G-25 analyzed for its percentage composition of the different molecular-weight fractions.

Q. Do you remember the range? A. Yes. The molecular weight ranges from one thousand to approximately fifty thousand.

Q. Now, with respect to this G-40, have you fractionated it into low-molecular-weight and relatively high-molecular-weight fractions? A. Yes, I have had such fraction percentages also taken on the Paraplex G-40 of modern vintage manufacture.

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177 A. Yes, T-20 is the Paraplex G-40 itself, as it is sold by the Rohm & Haas Company. Exhibits T-24 and T-24-A represent the fractional parts of the original Paraplex G-40 that is represented by Exhibit T-20. In other words, in this bottle, namely, Exhibit T-24, we have 67 per cent, which is the more viscous, higher-molecular-weight

resinous portion of the Paraplex G--40, or the Paraplex G-40 as represented by Exhibit T-20. Exhibit T-24-A represents 33 per cent of the original Paraplex G-40, which is the more liquid, lower-molecular-weight part of the original Paraplex G-40. If I add these two bottles together and homogeneously mix them, that is, the Exhibit T-24
178 and the Exhibit T-24-A, I get six ounces, exactly the same thing that I have in Exhibit T-20; I get the original Paraplex G-40 back again.

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Q. Mr. Tierney, how does the higher-molecular-weight fraction contained in the bottle marked Exhibit T-24 compare in viscosity and other physical characteristics with the Paraplex G-25 of recent purchase, exemplified by the material in Exhibit T-22? A. It is a soft, viscous resin of about the same viscous nature as the Paraplex G-25, perhaps a little more viscous in its character than the straight Paraplex G-25.

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179 Q. Now is the liquid fraction, that is, the material exemplified by the material contained in the bottle marked T-24-A, a plasticizer? A. It is.

Q. Is it an ester plasticizer? A. Yes, it is.

Q. And is it a liquid ester plasticizer? A. Yes, it is.

Q. Is it a liquid phthalyl plasticizer? A. No.

Q. Well, what is it? A. It's a liquid adipyl plasticizer.

Q. What is the relationship between a liquid phtalyl ester plasticizer and an adipyl ester plasticizer? A. They are both plasticizers; they are both esters of organic dicarboxylic acids; they are both liquid; they are both non-volatile.

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180 A. When the liquid material of Exhibit 24-A is mixed with the soft viscous resinous portion of Ex-

hibit T-24, a non-migrating plasticizer blend is produced which when used in the same manner as the procedure indicated in example No. 1 of the Oace patent, it produces the same end results and the same product, namely, the stretchable, retractable plastic film backed electrical insulating tape, with pressure-sensitive adhesive in permanent equilibrium with the backing.

Q. Well now, what conclusions do you draw in respect to the similarity or difference in function between this liquid ester fraction of Exhibit 24-A when combined with a high molecular weight fraction from Exhibit T-24 as compared with the function of a liquid phthalyl ester plasticizer when combined with a high molecular weight Paraplex G-25 in current production? A. The conclusion that I draw is that the same function is obtained in both cases, and the same end result is obtained by the same method of blending and procedure. In the mixing of the low molecular
181 weight, ester plasticizer of Exhibit T-24-A, with the viscous alkyd resin plasticizer of Exhibit T-24, a plasticizer is obtained that gives essentially the same function as the combination of the Paraplex G-25 in the ratio of 2 parts to 1 part of DOP. Now, that same result is obtained by using the two parts of the viscous resi ous material of Exhibit T-24 with 1 part of the liquid low molecular weight ester of Exhibit T-24-A.

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A. Yes, I have had Paraplex G-25 of current vintage fractionated in the same manner as utilized in the fractionation of Paraplex G-40, and the two bottles that are now in front of me, namely, Exhibit T-25 and Exhibit T-25-A, represent the results of that fractionation. You will notice that this time the amount of the low molecular weight liquid fraction is about half that amount that was fractionated

from the Paraplex G-40. In this case, with the Par-
182 aplex G-25, the liquid fraction of low molecular weight that was separated from the original Paraplex G-25, amounted to approximately 12% of the original Paraplex G-25. That 12% portion of liquid material is represented by Exhibit T-25-A, and as I turn the bottle on its side you can see its liquid character. The Exhibit T-25 represents the viscous higher molecular weight resin portion, namely, 88% of the original Paraplex G-25.

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183 Q. Now, there has been a discussion about these phthalyl esters, the sebacic acid esters and the adipic acid esters. What generally is the relationship between these esters? A. They are all liquid plasticizers offered in commerce, in the same grouping and referred to in the literature in the same groupings. They are each the ester of a di-carboxylic acid, namely, the phthalyl ester is the ester of the di-carboxylic phthalic acid, the sebacyl ester is the ester of the di-carboxylic sebacic acid and the adipyl ester is the ester of the di-carboxylic adipic acid.

Q. Well, when you speak of an ester, have you defined that? A. I don't recall whether I have or not. It is the reaction—it is the product of the reaction of an al-
184 cohol with an organic acid, namely, an hydroxy compound with an organic acid that has the COOH group, which is referred to as the carboxylic acid group.

Q. Now these esters that we have just discussed, are they known to be useful in the art as plasticizers for vinyl chloride polymers and other synthetic resins? A. Yes they are.

Q. Now, how do these three that we have spoken of, the phthalyl ester, the sebacic ester and the adipyl ester compare as plasticizers? A. They all function in the same way

in producing soft pliable, stretchable and elastic plasticized polyvinyl resin films.

Q. You have referred to the fact that the classification of these esters together has been referred to in literature. Have you any literature references? A. Yes I do.

Q. To support that statement? A. Yes I do.

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189 Q. Mr. Tierney, you've already introduced and identified the polymerized ethyl acrylate as the complete material. Did you fractionate that material? A. Yes I did.

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190 A. Exhibit T-26-A represents the liquid or low molecular weight fraction of the original polyethyl acrylate polymer resin, exemplified by Exhibit T-18. It represents, in short, 28% of the ethyl acrylate material represented by Exhibit T-18. As you tip the bottle you will notice that although somewhat viscous in character, it is liquid and flows quite readily. Exhibit T-26 represents the higher molecular weight fraction of the original ethyl acrylate polymer resin exemplified by Exhibit T-18. This material of Exhibit T-26 represents 72% of the original ethyl acrylate polymer resin of Exhibit T-18. As I turn the bottle on its side you will notice that it is soft but quite viscous. It is a resin and has resinous character.

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193 A. In my opinion I believe the patent itself and the specification of the patent makes clear what is meant by the term: "Major proportion" because the definition of it has been given in that section I just quoted from column 4, lines 58 to 66 of the patent, namely, that the major

proportion can extend to the 100 parts, to zero parts of the other material.

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A. That the plasticizer should contain that proportion of a "non-migrating viscous plasticizer resin".

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197 Q. Will you state whether or not in the accused Plymouth tape there is a stable blend of the vinyl chloride-vinyl acetate and the backing member? A. Yes, there is. The record shows that the polyvinyl resin utilized by the Plymouth Company in the manufacture of their plastic electrical insulating tape is the VYNW type, namely, the 95:5 vinyl chloride-vinyl acetate copolymer. It is a stable resin.

Q. Is the same thing true of the backing member of the TUCK tape? A. Yes. The record shows, I understand, that Tuck Company also uses the VYNW type of vinyl copolymer resin for their backing for their number 330 black plastic electrical insulating tape.

Q. Now state the fact as to whether the backing member in the PLYMOUTH tape and the TUCK tape include a copolymer of monomers. A. Yes, both the PLY-
198 MOUTH tape and the Tuck tape include a backing member that is formed of the copolymer of the monomers, namely, vinyl chloride-vinyl acetate.

Q. What is the fact as to whether the plasticizer material in the accused PLYMOUTH tape makes a stable blend with the vinyl resins of the backing? A. It does.

Q. State the fact whether the pressure-sensitive adhesive coating in the PLYMOUTH tape is eucohesive, as that term is defined in the patent. A. The unwinding of the rolls of

PLYMOUTH tape demonstrates that the pressure-sensitive adhesive coating has eucohesive character, in that its cohesive strength is higher than its adhesive strength, and the adhesive coating is aggressively tacky.

Q. State whether the pressure-sensitive coating on the TUCK vinyl plastic tape is eucohesive in the same sense. A. The adhesive coating on the TUCK tape is also eucohesive in that same sense, namely, that the adhesive coating has higher cohesive strength than its adhesive strength.

Q. What is the softening temperature of the copolymer vinyl chloride-vinyl acetate, the major proportion of
199 which is vinyl chloride, as employed in the accused PLYMOUTH tape and also in the TUCK tape? A. The softening temperature of the vinyl copolymer resin utilized in the PLYMOUTH tape and the TUCK tape is about 280 degrees F.

Q. What is the fact as to whether the copolymer of vinyl chloride-vinyl acetate used in the backing of both of those films is insoluble in water, or substantially so. A. It is insoluable in water; that is, the material used on both tapes for the backing member produces a material that is water insoluble in both instances.

Q. I think you have already testified that a copolymer vinyl chloride-vinyl acetate plasticized with G-40 is not normally black in color, haven't you; or what is the fact? A. The fact is that the vinyl chloride-vinyl acetate copolymer resin itself, plasticized with G-40, is transparent and colorless, or very slight amber in transparency. The black color of the tape backing used for the PLYMOUTH tape, the TUCK tape, and the SCOTCH brand number 33 and number 22 plastic electrical tapes results from the addition of a very minor amount of carbon black as an opaci-

fying pigment, namely, about .5 to one and a half parts to 100 parts of the vinyl resin.

200 Q. What causes the black color of the G-40 tape of PLYMOUTH; that is, assuming the use of G-40? A. The black color is caused by the addition of carbon black pigment in minor amounts, namely, .5 to 1.5 parts to 100 parts of the VYNW vinyl copolymer resin used for the backing in conjunction with the Paraplex G-40 as the plasticizer.

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206 Q. Mr. Tierney, you have already testified that you have studied and are familiar with the patents and publications that were relied upon by the defendant in this case . . . A. Yes.

Q. Now will you please evaluate in summary fashion these patents and publications with respect to the Oace patents in suit?

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207 A. With those deletions, it reduces the prior art citations to eleven U. S. patents—excuse me, eight—one Swiss foreign patent, and some twenty or more publications. Now in none of those patents cited nor in the publications is the method of making the product of the Oace patent in suit here, nowhere is the teaching found of how to make the Oace product. A number of the patents disclose separate parts of the Oace product. They dis-
208 close the vinyl resins, various plasticizers. Some are concerned with the problem of electrical insulation; some disclose plasticized films that are in the range of thicknesses of the film backing of the Oace product; for example, the Groff patent 1,966,856 discloses at page 4 the vinyl resins plasticized with 20 parts of dibutyl phthalate to

100 parts of the vinyl resin and that is formed into thin sheets that vary from .004 up to .2500 inch in thickness; in other words, that is a film of 250 mils in thickness. So that they cover the Oace range of thicknesses, both above, well beyond, as well as thinner.

Now the Groff patent was applied for August 10, 1931, and patented July 17, 1934. So that shows that the vinyl resins and the films of them were available.

Q. May I stop you there just a moment. The plasticizer in connection with that Groff patent is the same character of plasticizer that was used by Schmidt that you discussed during the discussion of the patent, is it not? A. Yes, that's right. That's the migrating type of plasticizer, such as the dibutyl phthalate, the halogen agent, as referred to in the Groff patent, page 2, column 1, lines 3 down to line 11, tricresyl derivatives. There was not the compatible type of non-migrating plasticizer of polymeric nature disclosed in the Groff patent.

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209 The publications of Rohm & Haas show that Paraplex G-20 plasticizer, a polymeric ester of sebacic acid and di- or poly-hydric alcohols, was available in 1929 and 1930. The rubber resin type of pressure-sensitive adhesives were available well before 1930. So that all of the materials were available to make the Oace product, but they waited for someone to put them together in the way that Oace, Eastwold and Snell did.

For example, one could have taken the vinyl chloride-vinyl acetate copolymer resin, such as those disclosed in the Groff patent, that were available in the early 1930's and could have plasticized it with the non-migrating, high-molecular-weight type of Paraplex G-20 resin and the dioctyl

phthalate, because dioctyl then was available and in use before 1925 as a plasticizer, and they could have blended,
mixed, milled and calendered those materials, be-
210 cause those procedures that are described in the Oace
patent for mixing, blending, milling and calendering the ingredients are, as I have stated, not new and novel. One could have produced the 4 to 20-mil thick vinyl plasticized vinyl polymeric film and he could have primed it with the earlier-art primers and the earlier-art pressure-sensitive adhesives and obtained a stable, stretchable and retractable insulating tape with the qualities of the tape of
the Oace patent in suit. But nowhere in any of these
211 prior cited patents, the foreign Swiss patent or the
twenty or more publications, was that taught prior to the time that Oace, Eastwold or Snell taught it in this patent in suit.

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215 Q. Has Minnesota Mining and Manufacturing
Company granted a license under the Oace patent, that is, the reissue patent 23,843 to the Johns-Manville Corporation? A. Yes, they have.

Q. Do you know the effective date of the license? A. The effective date was August 30, 1955.

Q. What rate of royalty did it provide? A. The rate of royalty is five per cent on the net sales of the product that comes within the scope of the Oace patent.

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216 A. I know of no other contracts in relation to this
matter that went along with this subject that were consummated, agreed to or signed.

The Court: Are you an officer of your corporation, oc-

cupying a position where, if such an arrangement had been entered into, you would have knowledge of it?

The Witness: I certainly think that with the responsibility that I have carried in the pressure-sensitive tape field I would have had some knowledge of any such other contract that would have had to do with this matter.

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217 Q. Now, during the month of September, under the provisions of that contract, has Johns-Manville paid a royalty? A. Yes, they have. The first royalty check, covering the five per cent royalty on the plastic tape sold by Johns-Manville Corporation within that period from August 30th to the end of September, has been received.

Q. In what amount? A. In the amount of $6,243, which indicates that, at five per cent royalty, Johns-Manville Corporation sold in the month of September over one hundred and twenty thousand dollars worth of this plastic electrical insulating tape that is the Oace patented product.

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Cross Examination

By Mr. Hector M. Holmes:

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254 Q. I mean, this polymerized ethyl acrylate is what this patent in paragraph 3, the complete paragraph refers to twice, as the "resinous type" plasticizer? * * * A. It at that point could include both because polymerized ethyl acrylate contains—it is itself a combination of modifiers. It contains low molecular weight liquid plasticizer, which is an ester material, namely, a liquid ester material, and it also contains high molecular weight resinous type plasticizer.

Q. That isn't my question. This paragraph twice refers to "resinous type plasticizers" and they mention three, Paraplex G-25 and in the same paragraph polymerized ethyl acrylate and as another example, polymerized vinyl butyl ether. Now, those are all three a resinous type of plasticizer are they not? A. They are all resinous type plasticizers and I might explain that the paragraph talks about the plasticizing of the vinyl resin and it indicates that a combination of modifiers should be utilized
255 to achieve the desired result of the patent, namely, that low molecular weight plasticizer should be combined with a high molecular weight plasticizer.

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Q. Now you state that this combination of the liquid type plasticizer and the resin type plasticizer is recommended to get the desired stretch. Would it not be a little more accurate to say it is specified rather than recommended by this same paragraph and the next one? A. It is correct to say that it is specified to get the complete result of the Oace patent, namely, the complete pressure-sensitive adhesive tape of the Oace patent.

Q. Those are the instructions to use this mixture of the liquid type and the resinous type? A. The instructions are as indicated in that paragraph, to use a combination of modifiers, which includes low molecular weight liquid plasticizers together with a substantially equal or somewhat greater amount of high molecular weight resinous type plasticizer, and then the paragraph proceeds to in-
256 dicate Paraplex G-25 as a specific example of a preferred type of the resinous plasticizer, and the paragraph further indicates polymerized ethyl acrylate as useful and suitable.

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262 A. Yes, they are non-migrating, but the patent, in column 3, starting with line 20, indicates that, in order to secure permanent equilibrum between the backing and the adhesive, the patent recommends that there be employed with the vinyl chloride polymer a — and I am quoting now, starting with line 23 — "a combination of modifiers including a substantial but minor amount (not to exceed about 20 parts per 100 parts of the vinyl polymer) of a low molecular weight liquid plasticizer . . . "— unquote for the moment — such as dioctyl phthalate is an example liquid plasticizer mentioned there. Now
263 dioctyl phthalate is a liquid ester of low molecular weight. I might now continue reading, after that, in line 27, quoting from the patent: ". . . together with a substantially equal or somewhat greater amount of a high molecular weight resinous type plasticizer, the amount of the latter in any event being sufficient, together with the liquid plasticizer, to provide the desired degree of stretch in the final film."

Now the patent points out there that, to get the permanent equilibrium and also the stretchiness you should utilize a combination of modifiers, one of which is a liquid plasticizer of low molecular weight, combined with a high molecular weight resinous type plasticizer. Now that language does not exclude the case where the material, the plasticizing material itself, can have both the low molecular weight liquid plasticizing material along with the high molecular weight resinous type plasticizing material, because in a separate sentence, starting in column 3, line 40: "Another high-molecular-weight plasticizer material which has been found useful in providing suitably stretchable and elastic vinyl polymer films is polymerized ethyl acrylate," and polymerized ethyl acrylate has both low-molecular-

weight liquid plasticizer and high-molecular-weight resinous plasticizer in it, in the same material, in much the same way that Paraplex G-40 has both the low-molecular-
264 weight liquid plasticizer present in it along with the high-molecular weight resinous plasticizer.

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266 A. The patent teaches that the combination of the liquid low molecular weight plasticizer, of which in the specific examples of the patent dioctyl phthalate is indicated, that the combination of that liquid plasticizer, with the high molecular weight resinous plasticizer such as Paraplex G-25, yields the product of the invention, but it also teaches that polymerized ethyl acrylate is a suitable plasticizer to achieve the same result.
267 The Court:

Q. What does it take the place of if you use it? A. It takes the place of the combination of the blend of the low molecular weight DOP and the high molecular weight resinous Paraplex G-25. That is, the ethyl acrylate polymer resin itself provides the equivalent because it has low molecular weight liquid plasticizer in it along with the high molecular weight resinous plasticizer of non-migrating character.

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Q. (By Mr. Holmes) Where does the patent say that it takes the place of both and may be used as the sole plasticizer? A. That patent doesn't say it in those specific words but in my testimony, and the patent itself in
268 column 5, line 21, says: "ethyl acrylate polymer has been found useful as previously noted. This modifier has somewhat less tendency to cause tack loss than does the Paraplex G-25, hence may be used in even greater amounts in many formulations", and beneath that, start-

ing with line 31: "It will be understood that where specific ratios of specific polymers, low molecular weight plasticizers and high molecular weight plasticizers are described in the examples, substitution of equivalent but somewhat different materials may require alteration of these ratios in order to obtain equivalent results all in conformity with well recognized principles." Now, looking at example No. 1, you will note that 200 parts of Paraplex G-25 is indicated there. Now, that is a high molecular weight plasticizer and it is described in one of the examples of the patent. Example No. 1 also indicates 100 parts of dioctyl phthalate. Now that is a low molecular weight plasticizer, a non-volatile liquid plasticizer, and the patent teaches that if you are to substitute a somewhat different material for those specific materials of the examples, it may be required to somewhat alter the ratios or the amounts to obtain equivalent results, and that is exactly what was done in the manufacture of Exhibit T-14, which is the roll of
269 plastic tape wherein the polyethyl acrylate plasticizer was used in the ratio of 100 parts to zero parts of any other plasticizer, because it had within itself, the requisite amount of low molecular weight liquid plasticizer combined with the requisite amount of high molecular weight non-migrating resinous plasticizer, and it achieved or it gave the equivalent results of the example 1 of the patent.

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. . . Now, if I could call your attention to column 4, starting at line 58 and proceeding down to line 67. I will
270 quote from the patent: "and in which the ratio of vinyl chloride to vinyl acetate was approximately 89:11. The commercially available 'Vinylite VYNS', sold by Carbide and Carbon Chemical Corp., is a suitable copolymer

corresponding to this description. Other equivalent materials include copolymers having other vinyl-chloride vinyl-acetate monomer ratios such as 95:5. Polyvinyl chloride itself is satisfactory in many formulations". Now, frequent reference is made to what the patent teaches as the meaning of the ratios comprehended, and the ratios there go from 89 parts to 11 parts, up to 95 parts to 5 parts, up to 100 parts to zero parts. Now, over in line 31 of column 5 it says: "It will be understood that where specific ratios of specific polymers". Now, ratios there teaches that what is comprehended in reference to specific polymers that are to be used in achieving the product of the Oace patent, that you can use 100 parts of the specific polymeric material, as long as it has the liquid low molecular weight plasticizer in it, combined with the high molecular weight non-migrating resinous type plasticizer. Ethyl acrylate polymer resin is an example of such. Paraplex G-25 and Paraplex G-40 are also examples.

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272 A. My interpretation in reading the complete specification or patent is that ethyl acrylate polymerized resin may be used as the sole plasticizer, yes.

Q. And that is the teaching of the patent. That's your position. Is that it? A. I state that the patent teaches that to me, yes.

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It says it can be substtuted for the G-25 and it can be used in greater amounts than the G-25 in many of the formulations. It certainly does not say that it cannot be used alone as the plasticizer, and in knowing what ethyl acrylate polymerized resin is and how it may be made to one in the art, he would recognize that the mention of the acrylate

polymerizer resin alone, and that additional mention that it can be used in greater amounts than the amount
273 of the Paraplex G-25, and then being told by the language of the patent that the amounts of the materials in this specific example should be altered in the light of the specific materials used in order to obtain equivalent results, he would know that the ethyl acrylate polymerized resin alone is a satisfactory plasticizer for the vinyl resins. He would recognize that the Oace patent is teaching in that — teaching him that.

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277 Q. Did this home-made Paraplex G-25 have an oil film on it? A. No, sir. . . . .

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291 . . . The plastic electrical insulating tape essentially the same as Example 1, with use of either G-25 or Paraplex G-40, has continued over eighty per cent of the volume of output of plastic electrical insulating tape made and sold by Minnesota Mining and Manufacturing Company within that period of 1945 through 1953. The remaining twenty per cent included tape wherein a polymeric plasticizer of a non-migrating type was used as the sole plasticizer, and that remaining twenty per cent portion also included some of the straight polyvinyl chloride polymer film that was plasticized with the sole polymeric plasticizer.

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299 Q. Now, the resinous type of plasticizer as thus referred to is of relatively high molecular weight is it not? A. Yes.

Q. The G-25 as I remember it is 8000 or thereabouts. Is that correct? A. It has a number average molecular weight

of 8000 but I would like to point out and explain that the very term there, number average molecular weight, indicates that there are present in the Paraplex G-25, molecules and percentage portions of different molecular weights. In other words, it's got a number of the low molecular weight molecules present, as well as a considerable portion of the higher molecular weight molecules.

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300 A. I think in my testimony I said the molecular weight of Paraplex G-25 ran all the way from 1000 to 50,000. That is of the weight average, molecular weight basis.

Q. That doesn't tell us how many molecules are of 1000 and how many are of 50,000? A. No it does not but it is specifically more important where any formulation that requires weight of material, is specified, so that you get within the formula the material on the weight basis.

Q. Now, G-40 I think is 6000 average molecular weight? A. Rohm & Haas indicates that it has a number average molecular weight of 6000, yes.

Q. Have you ascertained what the weight distribution of G-40 is? A. Yes sir I have.

Q. The range? A. Yes sir, I have.

Q. How is that range? A. That ranges from 1000 to 50,000, but the molecular weight distribution indi-
301 cates that there is present in it a far larger quantity of lower molecular weight material than is present in the Paraplex G-25.

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A. You have some material in Paraplex G-25 that would be identical to DOP in its viscous character.

Q. I thought you said it didn't run below a thousand. Now, that would be a lot more viscous, three times practically in weight than the DOP, and it would be substantially more viscous would it not? A. There is not a direct co-relation between the molecular weight of different chemical compounds and the viscous nature of those same compounds.

302 Q. But it remains resinous does it not? A. Yes, the portions of Paraplex G-25, the molecules and the parts of it, would all probably qualify for the term resin.

Q. Now here is Exhibit T-25-A, which is tabbed the liquid fraction of G-25. Now, it's your evidence then that this is substantially the same in its liquid character as DOP. Is that so? This pours something slower than molasses. The DOP is as light as can be. A. I don't believe I characterized those two as identically the same. I said that both were liquids. I believe I stated that the liquid portion of Paraplex G-25 was somewhat more viscous in character than the DOP.

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303 Q. Now, as to T-24, what you would term the light fraction remains a resin, T-24-A, a non-migrating resin plasticizer, does it not? A. I believe you have two sections in your question, or two parts of it. My answer to the first part is that the low-molecular-weight portion, the liquid part, Exhibit T-24-A, is properly termed a resin. I have forgotten now the second part.

Q. And it is a non-migrator; is that not so; it would be so classed? A. It is non-migrating when it is combined with its complementary portion, namely, the higher-molecular-weight, as that viscous alkyd resin portion of the Paraplex G-40, which is exemplified by Exhibit T-24.

Q. Is it not substantially non-migrating by itself? A. It is non-migrating under what conditions and with what, sir?

Q. Well, any vinyl chloride? A. Under what conditions, sir?

304 Q. Normal conditions, in a tape. A. In the pressure-sensitive adhesive tapes such as we are talking about here?

Q. Yes. A. I believe it would be non-migrating. Certainly it would not migrate as much as the dioctyl phthalate.

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306 Q. Now when did you make the polymerized ethyl acrylate which you said was fractionated by Dr. Rathman? A. Your question had reference to the tape?

Q. No, the polymerized ethyl acrylate which is Exhibit T-18? A. That material was produced sometime within the last 40 or 50 days.

Q. And produced at your plant of the Minnesota Mining? A. Yes.

Q. T-24 as I remember is the more viscous fraction of the G-40 which you fractionated. What is the molecular weight of the material T-24? A. The average weight, average molecular weight is approximately 15,000. Now, that in polymerizations of the type of linear polyester such as Paraplex G-40 represents, is approximately twice the number average of molecular weight figure, so that if that average molecular weight were to be expressed as the number average molecular weight, the Exhibit T-24 would have the number average molecular weight approximately in the range of 7000 or 7500.

Q. Now, take T-24-A which is the less viscous fraction

of the G-40, which was T-20, what is the molecular weight of that fraction? A. The weight average molecular weight of the material of Exhibit T-24-A is 5300, so that
307 the approximate number average molecular weight on that basis would also be approximately half, in the range of 2500, indicating that the liquid material there has from 1 to 20 links of the original unit, whereas the T-24 has material that runs all the way up to 150 links.

Q. You have said that the liquid material has so and so. Would it be accurate also to say that the resinous material has so and so, of T-24-A? A. Yes.

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A. The material of T-25, which is the more viscous resinous portion of higher molecular weigh of Paraplex G-25, has a weight average molecular weight of approximately 25,000, which indicated that the number of links of the original units present in that material, run from an aver-
age of 80 up to 150 or more, to yield that viscous
308 alkyd resin.

Q. Now, T-25-A was the less viscous alkyd resin portion of the G-25. What is the molecular weight of that less viscous alkyd resin portion? A. The weight average molecular weight of Exhibit T-25-A is approximately 10,000, which means that in that liquid material there are from 1 to approximately 36 links of the original unit.

Q. Now when Dr. Rathman fractionated the samples, what method did he pursue? Would you state it in reasonably simple terms so I can understand it and it will have to be simple? A. I'll do my best, sir. He dissolved the material in a ketone solvent and then progressively added water in small quantities to the solution. The higher molecular weight portion of the material tends to separate

out first. In other words, it is less soluble in the solvent, that might consist of 95 parts of the ketone solvent and 5 parts of water. Then that portion which is separated out was dried and evaporated, that is, the solvent was evaporated to leave the solid material. An additional amount of water was then added and the next range of high molecular weight material separated out, and so on until he got down to the remaining portion where the more
309 soluble lower molecular weight lighter part of the Paraplex G-25, Paraplex G-40 or ethyl acrylate, remained.

Q. So these heavier materials as you progressed, come off and then more come off and more and so on as you progress? A. The way they are separated, it is in just the reverse order of what you just stated. The higher molecular weight material comes out and then as you go along progressively the material of lower molecular weight tends to separate out until finally you are left with the material of the low molecular weight, which formed the liquid fraction.

Q. Well, it goes along progressively; so to speak; some heavy material comes off, and then some more, and then some more, and so on? A. Yes.

Q. So, in fractionating, you can divide the material into any sized fractions you desire, can you not? A. Yes.

Q. You can get a fraction of fifty per cent, the heavier material, and then take that and what is left is fifty per cent of lighter material? A. Yes.

316 Q. If you speak of an ester plasticizer, that term includes both liquid type plasticizer and resin type plasticizer, does it not? A. Yes, it might, under certain conditions.

Q. What conditions? A. The condition such as is present in Paraplex G-40, for example.

Q. Perhaps you will pursue that. I don't quite understand what you mean. A. The Paraplex G-40 has a portion of liquid ester plasticizer in it of low molecular weight, and it has in it a portion of soft, viscous alkyd resin of higher molecular weight.

Q. Is T-24, which is the heavier, more viscous fraction of G-40, an ester plasticizer? A. It is chemically a polymeric ester plasticizer that is non-migrating in character.

Q. So it is an ester plasticizer, using that term in its broad classification as we have been using it so far, as having an ester chemical structure? A. It is what they call a linear polyester plasticizer, yes.

Q. And it could be termed an ester plasticizer? A. Yes.

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319 Q. So T-24, T-24-A, T-25, T-25-A are all polymeric esters. Is that not correct? A. They are all polymeric esters.

Q. I notice at page 179 of the record and continually thereafter you referred to T-24-A, and I think you also referred to some of these other resin fractions as "an ester plasticizer"? A. Yes, that is what it is.

Q. And you referred to the heavier portions of the fractions as the portions or fractions of these polymeric esters as viscous resin plasticizers. Now, why did you refer to T-24 as an ester plasticizer? T-24-A as an ester plasticizer and T-24 as a resin plasticizer? A. Because that is what they are.

Q. Well, with equal truth you could have called them both

a plasticizer, couldn't you? A. Yes, they are both a plasticizer.

Q. And with equal accuracy you could have called T-24 an ester plasticizer. Is that not so? A. T-24 is an ester plasticizer of very viscous character because it is polymeric.

Q. Now, by calling T-24-A an ester plasticizer, you did not distinguish it in any way from DOP which is also an ester plasticizer. Is that not so? A. Both are liquid
320 ester plasticizers, yes, DOP and the material of Exhibit T-24-A, and they are both of low molecular weight as contrasted to the material of Exhibit T-24.

Q. Well, most of your answer was quite unresponsive. I asked you if DOP is not also an ester plasticizer? A. Yes sir it is.

Q. And when you call T-24-A an ester plasticizer, you do not distinguish it in any way from DOP? A. That's right, they are both properly called ester plasticizers, and they are both liquid and both of low molecular weight as contrasted to the material of Exhibit T-24, which is the soft, viscous resinous portion of higher molecular weight Paraplex G-40.

Q. By calling T-24-A a resin plasticizer, you do distinguish it from a liquid type DOP do you not? A. DOP is generally not called a resin.

Q. Is it ever called a resin? A. No it is not, not that I have ever come across.

Q. So if you want to distinguish T-24-A from DOP, you do, and you have in this testimony, called T-24-A a resin plasticizer? A. It is a liquid ester plasticizer.

323 Q. Now, when you mix G-40 or G-25 let us say, with DOP, take a ratio of two to one, you have a mix-

ture of a very low weight migrating liquid type plasticizer and a high molecular weight non-migrating viscous resin type of plasticizer. Is that not so? A. You have a plasticizer blend.

Q. Well, it can be termed a mix can it not? A. If you prefer to call it a mixture, I imagine that is your preference.

Q. And each of those constituents, DOP and the G-40 let us say, maintains its identity. There is no chemical change? A. In a blend or mixture as you prefer to call it of DOP and Paraplex G-25, you have a physical mixture in which the DOP and the Paraplex G-25 are not chemically combined; that is, the DOP can be separated from the blend of the two materials.

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330 Q. Now, are all these which I have enumerated, except G-20, and which are non-polymeric, migratory and capable of producing pastiness of adhesive when used as a sole plasticizer with vinyl chlorides in amounts sufficient to give adequate strength, say over 20 parts up to 30 or 35, or whatever? A. I don't know sir. I haven't tried them. They are all examples of liquid ester plasticizers, namely, esters of similar type di-carboxylic acids and they were referred to for that purpose of showing that in the literature the esters of phthalic acid, adipic acid and sebacic acid, are commonly grouped together as similar materials for similar plasticizing end use.

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Cross Examination

By Mr. H. L. Kirkpatrick:

332 Q. Did I understand you to say this morning, Mr. Tierney, with regard to T-34-A, that it had molecules of from one to twenty units or links? A. Yes.

Q. And that T-25-A has molecules of from one to thirty-six units or links? A. Yes, sir.

Q. Do you agree that you previously testified that
333 the lowest molecular weight in G-40 was a thousand?

A. I may have said that, yes.

Q. Then will you also agree that the unit of G-40 is about 174, or thereabouts? A. No, I will not agree to that. The individual unit of G-40, which constitutes the combination of adipic acid with two molecules of propylene glycol and the resulting elimination of two molecules of water, yields a unit that is 262, which is the molecular weight of the one unit of G-40 that may combine together with other units in making the polymer of increasing molecular weight in the polymeric material.

Q. But, at any rate, is not the chain a multiple of units of the order of four or five, even on your figure of 262 instead of my figure of 174? A. The majority of the material is above 262; in other words, there is not much of the one-unit material in the Paraplex G-40. However, there is the appreciable quantity of the liquid material that comprises varying amounts, running from two, three, four, five, ten, or twenty links, which, when combined together, yield the liquid material of the Exhibit T-24-A.

334 . . . and, as a practical matter, don't chemists like you divide that unit, which you took at 262, into the thousands to get the minimum number of units? A. I don't know that I understand your meaning there.

Q. Your unit value was 262? A. Yes, that is the original unit of the reaction between adipic acid and two molecules of propylene glycol to form the di-glycol, di-propylene glycol adipate.

Q. And dividing the 262 into a thousand we get approximately four? A. Yes.

Q. And wouldn't that indicate, then, that the minimum length of chain was four or more, to a chemist? A. It would. If I said that the Paraplex G-25 and the Paraplex G-40 was one to fifty thousand, I was giving the approximate range by molecular weight that is present. I will say that there may very well have been a small portion that would be from five hundred to fifty thousand.

Q. But you don't suggest that there was a portion of monomer in there? A. There might be a very small portion of the original single unit present; it would be very small.

Q. And you really mean very small? A. Yes.

335 Q. Such as would normally go out in a finishing operation of the material? A. I would say that it is present to the extent of less than one per cent.

Q. It might even be infinitesimal; more likely infinitesimal? A. That would depend on the way it was made. The range of molecular weights that the person obtains in linear polyester condensations of that type, such as produces Paraplex G-25 and such as produces Paraplex G-40, depends upon the conditions under which it is made and, particularly, the amount of vacuum and the time interval that it is heated or reacted and upon how it is agitated in the procedure.

Q. Is there any evidence of any monomer in the G-40 that you have ever seen or heard of? A. I, personally, have not found any, but I, personally, have not fractionated the G-40 or the G-25 with the express aim of attempting to determine whether there is any monomeric unit present of the reaction product of adipic acid and propylene glycol.

Q. Now, passing to T-25-A, did you say that it has units from one to thirty-six or more? A. That was Exhibit T-25-A?

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338 A. . . . .I will say that there is enough liquid ester material in the Paraplex G-25 of current manufacture, and also an absence of real high molecular weight material in today's Paraplex G-25, such as to make Paraplex G-25, as it now exists, satisfactory for producing a saleable stretchable and retractable, plastic film backed, electrical pressure-sensitive adhesive tape, as described in the Oace patent.

Q. Is there any evidence that the current G-25 is any different from the 1944-1945 vintage of G-25 in that respect?

A. Yes. There is the evidence that I referred to in my testimony; namely, that, using today's Paraplex G-25, a pressure-sensitive adhesive tape of the type of the Oace patent is obtained, whereas, when Paraplex G-25 of the 1944-1945 vintage was utilized, that was not obtained, and the patent states that it was not obtained at that time.

Q. But you have given oil as one reason, as the difference between the two? A. Yes, I have referred in my testimony to the fact that the Paraplex G-25, as we received it from Resinous Products and Chemical Corpora-
339 tion, who at that time were a subsidiary of Rohm & Haas Company, had a layer of liquid oil on the surface of the Paraplex G-25 of that date; and some of the exhibits, namely, the analytical report of Mr. Perlich, confirmed the fact that there was oil present in the Paraplex G-25 of that date, and enough oil to be discernible in the analysis of the material. Just a moment and I will try to find the exhibit number of the Perlich report.

Q. I think it was 16, wasn't it? A. It was Exhibits 15 and 15-A.

Q. Is it your position that the old G-25 had more than a fraction of one per cent of the monomer present? A. No.

Q. But is it your opinion that in the current G-25 and G-40, that in each case there is a separable amount of the monomer?

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A. I have stated that I, personally, did not attempt to find any, nor did I direct Dr. George Rathman to attempt to find out how much of the monomer unit was present in today's Paraplex G-25 and today's Paraplex G-40.

340 Q. Then you have no opinion on the matter? A. I have an opinion on the matter, yes, from my knowledge of what would be the result in reacting the materials, namely, sebacic acid and di-propylene glycol—excuse me, in reacting sebacic acid and propylene glycol, and is reacting adipic acid and propylene glycol, and that opinion is that there could be some amounts of the single-unit material present. There would not be much and the amount that would be present would depend on the method of manufacture used. If the method of manufacture was such that not a good vacuum was maintained on the resin reaction kettle, and if the material were heated for a long period of time, the amount of the single-unit or monomer material would be more, because that reaction is a reversible reaction.

Q. Well, your position is that there could be some very small amount present in each case, a fraction of one per cent? A. Yes; and I will say that in 1944 and '45 there might very well have been three or four per cent of single-unit material present in the Paraplex G-25 of that date, because it would depend, as I stated, on the type of equip-

ment they had at that time, the quality of the vacuum, and the length of time that the materials were heated in
341 the reaction, and it would also have some bearing as to the size of the batch and the quality or efficiency of the agitation of the ingregients, namely, the sebacic acid and the propylene glycol.

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No Redirect Examination

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Plaintiff's witness **Ross I. Parker**

Direct Examination

By Mr. Harold J. Kinney:

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342 Q. How long had you been employed by the General Electric Company prior to that time? A. Forty-three years and three months.

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343 Q. What was your position with the General Electric Company just prior to the time of your retirement? A. As Commercial Vice-President, in Chicago.

Q. And how long had you occupied that position? A. Since July of 1948.

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A. I entered the company's employ immediately or within a few weeks of graduation from the University of Kansas, where I had obtained a degree of Bachelor of Science in Electrical Engineering, put on overalls and worked fifty-five hours a week for twenty cents an hour.

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344 Q. Did your company at one time introduce a product, insulated conductor or wire, known as FLAMENOL? A. Yes, sir.

Q. Can you tell us about when that was? A. To make sure that I remember the date, that trade-mark was registered in January of 1937.

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345 Q. Now can you tell us in a general way how the FLAMENOL conductors or wires differed from what had preceded that? A. Well, the normal insulation used on electrical conductors prior to the availability of FLAMENOL consisted of rubber in various stages of purity, depending upon the application of the cable and the temperature to which it was subject, which was one of the limiting features. FLAMENOL, it was found that this material could stand substantially higher temperatures, and that was one of the real outstanding contributions made by that type of installation.

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346 Q. How was this FLAMENOL wire spliced when electrical connections were made with it, back in the early days? A. The normal procedure would be to strip the insulation, twist the power conductors together, solder them; then use a rubber tape over that joint and a friction tape, as it was called, over the rubber tape.

Q. What can you say as to how satisfactory that type of splice was? A. Well, it had this handicap, in that it was subject to the same limitations as to temperature that the earlier rubber insulation had. Rubber will sustain combustion and is made, I believe you chemists would say, plastic by heat, will flow if it gets hot enough. So
347 will FLAMENOL, for that matter, but FLAMENOL will not sustain combustion and is subject, as I re-

call it — the underwriters gave eighty degrees, I think it was, for FLAMENOL and about sixty for rubber.

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Q. So do I understand that when you spliced a joint on the FLAMENOL wire with the rubber electrician's tape and friction tape, then you had, so to speak, a weak link in the electrical conductor? A. That is correct.

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Q. Did you at some time become familiar with a convenient, effective insulation material for splices on your FLAMENOL wire? A. Yes.

348 Q. What was that? A. That was this number 33 SCOTCH tape.

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Q. Now can you tell us about when you first became familiar with that, or when your company first started using it or selling it? A. Well, in Chicago I know that we started purchasing it in early 1947. It was sold there through the General Electric Supply Corporation, a wholly-owned affiliate or subsidiary.

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350 Q. Now I show you a document which has been marked for identification as H-13-B which bears the date of August 25, 1947, and is on the letterhead of General Electric Supply Corporation, and ask you if you can identify that or the signature on it? A. Yes, the signature is A. J. Lutz who at that time was Manager of the Supply Sales Division of the General Electric Supply Corporation's operation in Chicago.

Q. And this document refers to No. 33 Scotch electrical tape does it not? A. Yes.

Q. Do you note the first sentence there, which I will read: "For the first time in fifty years a revolutionary electrical tape is on the market ready for immediate delivery". A. Yes sir.

Mr. Holmes: What's the date of that? A. August 25, 1947.

The Court: Whose statement was it that you were reading about being a revolutionary tape? A. That was Mr. Lutz's statement.

351 Q. Did the advent of this Scotch plastic tape such as that No. 33 we spoke of, have any particular significance in connection with the use of General Electric Company's Flamenol wire cables? A. Yes, it was an aid to us in selling more of the product because of the elimination of the weak link, as you mentioned a while ago.

Q. Would your company have had a use for the No. 33 plastic tape of Minnesota Mining if it had been available on the market when your company first started merchandising Flamenol wire back in 1936? A. Yes.

Q. What effect, if any, did the advent of the plastic tape have on the applications and use of your Flamenol insulated wire and cable, after it came on the market? A. Well, as I thought I said, it made a complete job. It made it simple to use when a joint was necessary, as it frequently is.

Q. Did it widen the application and use of your Flamenol wire? A. Exactly. Anything that makes it easier to sell goods, that falls in that classification.

Q. Would there have been a market for this No. 33 vinyl plastic tape if it had been available on the

352 market around the time when you started with the General Electric Company in 1912? A. Yes, because — well, just one example of it is, no longer did a chap in overalls have to carry two rolls of tape in his pocket. He could do the same job with one roll.

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No Cross Examination

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Plaintiff's witness **Charles A. Womack**

Direct Examination

By Mr. Welch Jordan:

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352 Q. What sort of business are you in? A. Wholesale electrical and electronics supply business.

Q. How long have you been engaged in that business? A. Approximately seventeen years.

353 Q. How many places of business do you operate?

A. We operate a total of three electrical and five electronic supply houses.

Q. Where are they? A. These are located in High Point, Danville, Durham, Goldsboro. We have two stores in Goldsboro and Rocky Mount and in Lynchburg, Virginia.

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Q. Are you familiar with Scotch brand No. 33 tape which has been identified and offered in evidence in this case as Exhibit T-4-a? A. Yes sir I am familiar with it.

Q. When was the first time that you saw that type of tape approximately? A. Well, the best I can recall, ap-

proximately 1947 or 1948 we noticed advertisements in trade journals. As this tape seemed to be quite different from anything I had ever seen before, we immediately contacted the Minnesota Mining to see if distribution would be available to us.

Q. Now, prior to that had you even seen any tape like that before? A. No sir.

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354 Q. What sort of tapes do you refer to when you say two had been used previously? A. Normally in electric insulation the wires and cables are wrapped with a rubber compound tape over which is put a cloth asphalt coated tape as a protection.

Q. Is that cloth asphalt tape what is known as friction tape? A. That's the common name for it, yes sir.

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355 Q. Now Mr. Womack, you testified that you started in this business of wholesale electrical sales seventeen years ago. At the time you started in this business, if this Scotch No. 33 tape had been available at that time, would there have been a market for it? A. Yes sir, there would have been.

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No Cross Examination

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Plaintiff's witness **George S. Miles, Jr.**

Direct Examination

By Mr. Welch Jordan:

Q. Mr. Miles, where do you live at the present time? A. 1347 Citadel Drive N. E., Atlanta, Georgia.

Q. How long have you lived in Atlanta? A. I have lived in Atlanta since February of '53.

Q. Where did you live before you moved there? A. Greensboro, North Carolina.

Q. How long did you live in Greensboro? A. Since 1927.

356 Q. You were raised and educated here were you? A. Yes I was.

Q. By whom are you employed now? A. Minnesota Mining and Manufacturing Company:

Q. How long have you been employed by Minnesota? A. Since March of 1947.

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357 Q. They were both pressure-sensitive electrical insulating tape? A. Black insulating tapes, yes.

Q. Now, what position do you occupy with the company at the present time? A. Sales Manager.

Q. For what area? A. For the Southeastern area.

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360 Q. Roughly how many dollars worth of tape did you sell in the Carolinas and adjacent Virginia area in 1947, '48 and '49, that is, of this plastic electrical tape No. 33 and 22? A. The records show that for the years '47, '48 and '49 there was $88,105.00.

361 The Court: Q. In the three years combined? A. Yes sir.

Q. Give me the amount again? A. $88,105.00.

Mr. Jordan: Q. Who sold that $$88,105.00 worth of tape? A. I'd like to think that I was personally responsible for the sale of that tape.

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A. The first similar competitive tape I saw in Greenville, South Carolina.

Q. When? A. That was in 1950.

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365 The Court: Q. What proportion do the tape sales bear to the other products that you sell? I don't mean exactly but approximately? A. I would say that the tape sales approximately represent 90% of the other products that I sell, dollarwise.

Q. Ninety percent dollarwise? A. Yes sir.

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Plaintiff's witness **R. V. Holton**

Direct Examination

By Mr. E. E. Ezell:

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366 Q. By whom are you presently employed and what is your present position? A. By the Minnesota Mining and Manufacturing Company and I am the General Manager of the Electrical Products Division.

367 Q. From what college or university, if any, did you graduate and in what year? A. From the University of Minnesota in the year 1938.

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368 Q. When was the first sale and to whom was the tape sold? A. The first sale was in February of 1945 to the Lyon Manufacturing Company in Chicago.

Q. This sale was made by you? A. Yes it was.

Q. That was the first sale that was consummated? A. Yes it was.

Q. Was this a new item in your experience? A. Yes it certainly was.

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373 The Court: Is Exhibit H-3-A the same type of pipe or conduit? The Witness: Right.

The Court: But wrapped with this tape? The Witness: Yes, it is.

The Court: But it does not appear to have been injured, although it has been in use eighteen months? The Witness: A year and a half.

The Court: That piece of pipe, if not wrapped with the tape, would have been exposed to the same conditions? The Witness: As far as we know, the vapors would attack both pipes in that area.

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382 Q. Now, dollar-wise, how much of the vinyl plastic electrical tape, pressure-sensitive electrical tape, did your company sell in 1945? A. In the neighborhood of ten thousand dollars.

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The Court: How have you got that sheet marked? The Witness: That is Exhibit H-12.

The Court: Is it a correct statement of the sales annually? The Witness: It is taken from the company
383 records, showing both sales and advertising expense.

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The Court: Why did you not give us the figures for 1954 and 1955? I see that tabulation stops at 1953.

Mr. Ezell: Your Honor, I think I can answer that. The suit was filed in 1954. We brought the records up to 1953, and that is as far as we haven taken them.

Q. Has SCOTCH vinyl plastic electrical pressure-sensitive tape received the approval of the Underwriters' Laboratory? A. It has.

Q. When? A. In the year 1947 first.

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Plaintiff Rests

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Defendants' witness **John M. De Bell**

Direct Examination

By Mr. Hector M. Holmes:

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422 A. The very first vinyl chlorides with which we worked around 1928 were used in a small way for molding compounds. Later they became used for sound records. A very large use which developed in the middle thirties was for rain-wear, shower curtains and cable insulation. These uses were of immense importance at the beginning of the war when the entire supply of polyvinyl chloride went to Army raincoats and to Navy flame-proof cable. The Quartermaster used both supported film for rain-wear and unsupported film for envelopes for weapons which were to be used in landing operations. Since that time the polyvinyl chloride has gotten into tremendous uses in drapes, curtains, upholstery, flooring, and
423 all types of utilitarian articles.

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425. Q. And were vinyl compounds available in the thirties, as ordinary articles of commerce, having the high vinyl chloride content? A. Yes. Now, they were

available from many people and were principally used in the rubbery, stretchable form.

Q. Was the VYNS such a product? A. Yes it was. That is, the base resin.

Q. And was the VYNW another such product? A. Yes it was. Those were both made by Union Carbide, now Bakelite Division.

Q. And both were staple articles of commerce in the thirties? A. Yes.

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427 . . . I'm sure that most of you recall the early shower curtains which were very flexible and rubbery at first, but had a tendency to stiffen on aging, as there was slight evaporation of the plasticizer.

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429 Q. Were some of the liquid plasticizers more migratory than others? A. Yes, but that is difficult to define, because migration depends not only on the small size of the molecule but also on how good a solvent it is for the polymer from which it is leaving and how good a solvent it is for the polymer or material to which
430 it is going.

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477 Q. What makes one plasticizer migrate and another type not migrate? A. There are several factors, one of which is the solubility of the plasticizer in the various things it is migrating to and from, but probably the greatest influence is just the size of the molecule itself. The little molecules, or those in the low molecular weight liquid plasticizers, those molecules are little fellows which can get around quite readily.

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482 A. Well, ester plasticizers are normally applied to the liquid plasticizers, but it is chemically correct to apply "ester" to any chemical structures, including resins, which have ester structures in them.

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483 The Court: Wait one minute please. I want you to take pages 179 and 180 of the record. I'll give you my copy, and point out what it is you say is grossly in error, or misleading.

A. Here on page 179, the fifth line from the top, Mr. Kingsland remarks about a bottle, 24-A, a plasticizer, and then he says: "Is it an ester plasticizer". The answer is: "Yes it is." He says: "Is it a liquid ester plasticizer." The answer is: "Yes, it is." Now, it is quite true that all these resin plasticizers are liquids in the sense that they are not gasses, they are not solids and they can in time—they can slowly be poured, but in the Oace patent, Oace makes a clear distinction in column 3, line 27, between a low—line 26—a low molecular weight liquid plasticizer and in line 29: "A high molecular weight resin type plasticizer." This fraction marked 24-A is a high molecular weight resin type plasticizer, and the answer to this question makes it appear that it might be a low molecular weight liquid plasticizer, which it definitely is not.

484 Q. He didn't say it was a low weight liquid plasticizer. Now will you read the balance of what he says on page 179 and page 180, in explanation of that? The reason I'm asking you these questions, you say he was grossly in error, and I want to know in what particular.

A. I understand sir.

Mr. Holmes: I think he used the word "misleading", your Honor.

A. It is certainly confusing here because Oace has defined, and we talked yesterday, and the trade understands the two plasticizer system, one liquid, which is the monomeric type, one resinous which is the high molecular weight resin type.

The Court:

Q. Now if I understand what the witness said on page 179 and page 180, he says that by the use of this you can get the same result here. I'm not talking about the Oace patent. I'm talking about what he testified and what you say is grossly in error, so that puts your testimony in flat contradiction to his and I want you to be specific about it because it is rather important. A. I understand sir. In looking at page 180, the remark is made that when 24-A—when the liquid material of Exhibit 24-A is mixed with a soft viscous resinous portion of Exhibit T-24, a non-migrating plasticizer blend is produced which, when
485 used in the same manner as the procedure indicated in the example in one of the Oace patents, it produces the same end results, etc.

Q. Do you say that is erroneous? A. This says that if the G-40 is reconstituted from the two fractions, it will make a good tape. We know from other experience—in fact from my own experience—that G-40 alone, and G-25 alone, will make a good tape. That is known now, but Oace teaches very clearly first, that you must have in addition to the resin plasticizer, a liquid—a low molecular weight liquid plasticizer such as dioctyl phthalate, and he specifically warns against taking a mixture like this and making a tape, although it is well known to us now that it will make

a good tape. That is the precise thing which Oace in column 3 line 45, says specifically cannot be done, and he says it again . . .

Q. Aren't you in this regard saying that this testimony has demonstrated that you can get a result contrary to the teaching of the Oace patent? A. Yes, of course.

Q. But are you saying now that you can't get what this witness said you could get? A. You'll get a very good tape this way.

Q. That part I understand wasn't in error. A. It wasn't
486 in error but the error arises in characterizing and confusing the lower molecular weight resin fraction, which is just another resin plasticizer, with the liquid plasticizer specified by Oace.

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487 The Court: Excuse me for interrupting there, but on page 177 the same witness, speaking of Exhibits T-24 and T-24-A, representing the fractional parts of the original Paraplex G-40, as shown by Exhibit T-20, said: "In other words, in this bottle, namely, Exhibit T-24, we have 67 percent, which is the more viscous, higher-molecular-weight resinous portion of the Paraplex G-40 as represented by Exhibit T-20."

Mr. Holmes: Yes.

The Court: Now he says: "Exhibit T-24-A represents 33 per cent of the original Paraplex G-40, which is the more liquid, lower-molecular-weight part of the original Paraplex G-40."

Do you agree with that, or is it grossly in error?

The Witness: It is true that of the more —

The Court: No. I asked you if you agree that that is correct, or do you disagree with it, as being erroneous too.

The Witness: I think the statement is correct, but it tends to confuse the two resin fractions with the liquid plasticizer.

The Court: Then he goes on further to say: "If I add these two bottles together and homogeneously mix them, that is, the Exhibit T-24 and the Exhibit T-24-A, I get six ounces, exactly the same thing that I have in Exhibit T-20."

488 **The Witness:** That's correct, sir.

The Court: I want to know if you agree with that.

The Witness: That is reconstituting the original resin plasticizer.

The Court: Well, if that's true, the division of it is manifestly true also, isn't it?

The Witness: It is quite true that those two fractions are also resin plasticizers and part of the original resin plasticizer. In fact, you can see, sir, by looking at the bottles —

The Court: I wasn't asking about that. I was trying to see how far it's possible for you two to agree on something. He says, on page 177, that in T-24 "we have 67 per cent, which is the more viscous, higher-molecular-weight resinous portion;" and then the "T-24-A represents 33 per cent of the original Paraplex G-40, which is the more liquid, lower-molecular-weight part of the original Paraplex G-40."

The Witness: Well, while that is technically correct, it would be more proper to say the lower molecular weight

resinous portion. I think that confusion will be made clear, sir, if one remembers that once a resinous plasticizer, always a resinous plasticizer.

The Court: I see what you are talking about.

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499 Mr. Holmes: Q. Referring to this ethyl acrylate which he produced, he (Tierney) states: "The composition that it has is controllable by the organic chemist, the polymerization chemist; he tailors it to produce
500 the ethyl acrylate polymer resin of the properties that he wants for the purposes involved". A. That is a correct statement, and the tailoring means that by varying the conditions of the polymerization, for example, the concentrations, the method of polymerization, the time, the temperature, the catalyst and other factors, different types of polymer can be produced as desired.

Q. Can the monomers be retained by such a tailoring, with ethyl acrylate? A. If the polymerization is not carried to completion, and if the product is not stripped, there will be monomer in the product.

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503 The Court:

Q. Let me ask you a question. On page 106 of the record Mr. Tierney said: "That film backing was 100 parts of the VYNS resin, 50 parts of ethyl acrylate polymer resin, 3.6 parts of calcium stearate. Now it was blended and milled, etc." Did your test of that sample disprove the use of the component parts outlined by the witness? A. Not at all sir.

Q. Did it agree with it? A. I have no reason to question that statement.

Mr. Holmes:

Q. Is there any reference in those patents to anything comparable to this tailored ethyl acrylate? A. Well, as regards the use of the ethyl acrylate, in this tape, I find no reference in the Oace patent to any tape that is made with a substantial portion of volatile solvent as an ingredient.

The Court:

Q. Let me ask you this: He says this thing we are talking about was blended and milled according to
504 the method described in the patent in example 1, column 6. Does that assist you in any way in answering the question Mr. Holmes just asked you? Described in example No. 2 of the Oace patent? Wait a minute. Let me make my question a little more clear so we won't be confused. The witness said that it was blended and milled according to the method described in the patent in Example 1, column 6. It was made to a 4 mil thickness. The backing was primed with a primer described in example No. 2, and it was coated with pressure-sensitive adhesive described in No. 2 of the Oace patent. A. The point I'm trying to make sir, is that the tape here had a substantial amount of volatile solvent which is not covered anywhere that I am aware, in the Oace patent. The Oace patent always specifies regarding the plasticizer system, that it is a two component system of low molecular weight liquid plasticizer and high molecular weight resin type plasticizer. It appears that there is ethyl acrylate monomer in this sample which does not come under either of those descriptions. It is a volatile solvent and it will disappear.

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Cross Examination

By Mr. Harold J. Kinney:

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522 **Q. . . . You read the Oace reissue and original patents, I assume? A. Yes.**

Q. Did you study the file history of each? A. No.

Q. Did you read them at all? A. Yes.

Q. You read them, but you did not study them? A. That's correct.

Q. Did you scan through each one? A. Yes.

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523 **Q. Have you ever been at the plant of Plymouth Rubber Company? A. No.**

Q. You have never seen them make any of this tape? A. No.

524 **Q. Have you ever seen pressure-sensitive tape made in a commercial plant? A. No.**

Q. Neither of this vinyl plastic tape or any other kind of pressure-sensitive tape; is that right? A. No—that's correct, yes.

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525 **Q. Did you make any study with reference to the poisoning of pressure-sensitive adhesives prior to your testimony here? A. Yes.**

Q. Since this litigation commenced? A. Since this litigation commenced.

Q. None before that? A. None before that.

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Q. Have you made studies of migrations of various plasticizers? A. I don't know whether you would call them studies. I have been faced with that as a technical problem since 1936 and '37. We had difficulties to overcome which involved migration of plasticizers.

Q. And since you have been concerned with this case have you learned that the migration of plasticizers is a particularly acute problem in connection with making a stretchable, retractable plastic tape? A. I am not aware that I have learned anything since the commence-
526 ment of this case that I did not know, at least qualitatively, before regarding migration.

Q. Have you ever made any studies about the spewing, or syneresis, effect that is sometimes encountered in plasticizing polymers or copolymers? A. Again I don't know whether you would call them studies, but I have been faced with it as a problem, many times.

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529 Q. Now would you say that Paraplex G-25 of 1945 vintage, blended with a vinyl, may have been an improper combination? A. I would expect it to be a proper formulation.

Q. Did you ever blend any Paraplex G-25 with a vinyl film in 1945? A. No.

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Q. Did you notice more variation in the G-25 from batch to batch in 1945 than you have noticed recently? A. We had only one batch, 5409.

Q. Rohm & Haas had many, many batches? A. Yes.

Q. And didn't you get more than one sample from them in 1945? A. We have only 5409, it is the only sample I

know of that we have from Rohm & Haas in that
530 period.

Q. Did you, yourself, have that in 1945? A. Yes.

Q. And you have had it ever since? A. Yes.

Q. Well, is that the only sample you got of it in 1945? A. Yes,

Q. So you don't know whether Rohm & Haas' commercial production varied from batch to batch? A. No.

Q. Now I understand that your first experience with avoiding poisoning of adhesives has been since you have been engaged in this case, in the last year or so? A. I wouldn't say that, although we have never referred to the poisoning of adhesives, as such. Over many years and in many different connections we have been faced with the problems of difficulties with adhesives which probably could be described as poisoning, in the sense that they either get stickier or get less sticky.

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531 Q. This experience you had with poisoning of adhesives prior to your engagement in the present case was a rather casual experience; is that right? A. No, it was dfinitely not casual. I can't say that it was particularly related to this case.

Q. Did it concern itself with pressure-sensitive adhesives? A. No.

Q. It did not?

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534 Q. I was looking at Claim One when I phrased this question, and I said, it appears to me that this patent suggests taking a plasticized polyvinyl chloride sheet, coat-

ing on one side of it a polymer of isobutylene and then coating thereover a pressure-sensitive adhesive, the theory being that a polymer of isobutylene will prevent the migration of plasticizers from the backing into the adhesive. Is that not an accurate characterization? A. That seems consistent with Claim One.

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535 Q. You agree that I accurately characterized this invention? A. Yes. that seems quite consistent with Claim One.

Q. Now, at the time did that seem to you like a good suggestion of a way for preventing migration of the plasticizer from the backing to the adhesive? A. Yes.

Q. And was that suggestion made because neither you nor Mr. Nickerson at that time knew of any way of setting up an equilibrium between the adhesive and the plasticized backing so that the tape would not lose its tack or go pasty over a period of time? Is that the reason why the barrier layer was put in between? A. No. My recollection is that we were trying to get a better bond between the back-
536 ing tape and the adhesive. That is my best recollection at this late date.

Q. Well now, this Claim One says that this polymer of isobutylene prevents the migration of migratory plasticizers from the backing into the adhesive? A. That is correct.

Q. Wasn't that the purpose of putting that polymer of isobutylene on the plasticized vinyl backing? A. That was *a* purpose but not as I recall it, *the* purpose.

Q. Well, in addition do I understand you are saying that of course you would have to get good bonding between or

you wouldn't have a unitary tape? A. We wanted better bonding between, as I recall it.

Q. Better bonding than what? A. Better bonding between the adhesive layer and the polyvinyl chloride acrylonitrile rubber backing than we had obtained up to that time.

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539 Q. This top surface is the pressure-sensitive adhesive. Now, when we wind this upon itself, the pressure-sensitive is going to come right over in contact with the vinyl film, or the plasticized vinyl film? A. Yes.

Q. Now, what's going to keep the plasticizer from migrating? A. Which plasticizer?

Q. The plasticizer of the vinyl film? A. The plasticizer of the vinyl film is non-migrating plasticizer.

540 Q. So there was no need for the barrier coat at all? A. No. The things that would migrate are in the adhesive film.

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Q. So that we don't get too far afield, if you will look at the very end of Claim One you will see the language: "In preventing the migration of migratory plasticizers from the backing into the adhesive"? A. That is correct.

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541 Q. Well now is there some mistake here where this Claim One was talking about preventing migration of the migratory plasticizers from the backing, into the adhesive? Is that not really a problem? A. That certainly was a problem at that time.

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543. Q. If the adhesive is bonded strongly to the backing initially, are you saying that there isn't much tendency for it to offset even if the plasticizer migrates into the adhesive and renders it pasty? A. No. If there is any surface of the backing material which attacks the particular adhesive used, or vice-versa, there will be trouble unwinding.

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544. Q. Didn't Dr. Nickerson contemplate winding it up in a roll? A. Yes.

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545. Q. Well now let me ask you another question like the last one, but I want to confine it to pressure-sensitive tapes. Was your work in connection with this project with Dr. Nickerson, your introduction to the problem of preventing migration in connection with the making of pressure-sensitive adhesive tapes? A. I think so. I do not recall at the moment earlier instances.

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546. Q. Well, you knew of the Scotch brand stretchable and retractable vinyl backed electrical tape before the Nickerson application was filed on November 20, 1948. Is that correct? A. I think so.

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550. Q. Now, before we leave this subject, what was your first introduction to the problem of migration in connection with pressure-sensitive tapes; was that in connection with the Nickerson project? A. This is the first one that I recall at the moment.

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551. Q. This is the sole project of your laboratory, which blossomed into an application, that you can recall? A. And a patent, yes.

Q. This Nickerson patent? A. That's right.

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552 Q. Did you make any pressure-sensitive stretchable and retractable vinyl plastic tape of any kind? A. No.

553 Q. None at all? A. No; that is, with all the adhesive and the priming layer and everything on.

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554 Q. I am referring to that language which says: "These unique and valuable results are obtained by utilizing an insulating tape in the form of a relatively thick but easily stretchable and highly elastic pressure-sensitive adhesive tape comprising a well-bonded, water-insoluble, non-corrosive, normally tacky and pressure-sensitive adhesive coating on a plasticized vinyl chloride
555 polymer film which is in permanent equilibrium with the adhesive," and then "permanent equilibrium" is defined. A. Yes.

Q. Now this patent solved that problem, didn't it? A. Yes.

Q. And that was the central problem in this patent, wasn't it? A. I would say so.

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556 Q. And various plasticizers migrate; G-40 migrates, doesn't it, unless you have a state of equilibrium? A. As a practical matter, G-40 doesn't migrate.

Q. Well, how about G-25; does it migrate? A. As a practical matter, G-25 doesn't migrate.

Q. What do you mean by "a practical matter"? A.
557 I earlier stated that I felt that even the non-migrating plasticizers migrate, but it would probably take

so long for them to become ineffective, for example, five hundred or a thousand years, that it would not concern us seriously.

Q. I believe you have said that you have looked at this Rohm & Haas literature, those booklets on plasticizers, and so forth; is that correct? A. I have looked at some, yes.

Q. And, in general, do you feel that those are quite authoritative works on the habits of plasticizers? A. Yes.

Q. How much plasticizer like G-40 or G-25 will migrate depends on what it is next to, doesn't it? A. Among other things, yes.

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559 Q. Then am I not right in saying that this table illustrates that, in contact with that varnished surface, the tendency of Paraplex G-40 to migrate out of the vinyl into the varnish surface is as great with Paraplex G-40 as it is with dioctyl phthalate; is that not true? A. The two blocks which show this, which are supposed to characterize the marring, are there the same for Paraplex G-40 and for dioctyl phthalate.

Q. Now, when you go over further horizontally in those two columns, under the "35%" you note three squares are green opposite the Paraplex G-40, and only two squares are green opposite the dioctyl phthalate? A. That's correct.

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561 The Court: Let me ask you a question in that connection. How do you account for it, if it's in the material that is used and not in the Paraplex G-40 that he's talking about, why wouldn't the same principle obtain in the G-25 up there?

The Witness: I would think, sir, that the lacquer has the bad behaviour; that is the mobile plasticizer in this case which wants to go out and stick to the adjacent film; and I would say that these tables indicate the amount of resistance that such a plasticized film gives to that tendency of the light phthalates in the lacquer to attack the film; and, in that connection, I would agree with Mr. Kinney that the nature of the medium into which the migrating material is moving is important.

The Court: On this table, in the right-hand column, with respect to Paraplex G-25, it shows only one block under the 35 per cent, while G-40 shows three times
562 that, doesn't it?

The Witness: That's right; and that means, to me, that the liquid plasticizers in the lacquer attack the Paraplex G-40 film much faster than they do the Paraplex G-25 film, and, in fact, they offer as much trouble, or even more, when the vinyl film is plasticized with dioctyl phthalate, but the worst migratory element in the system covered by this table is the plasticizers in the lacquer film.

Q. This book says nothing about that, though, does it? A. I think it indicates it: "In testing plasticizers for migration, lacquers are employed which are not particularly plasticizer-resistant."

Q. Now, really, Mr. DeBell, as I understand, what you are saying is that the data recorded here does not measure the migratory tendencies of the materials listed on the left-hand side of this table at all, but measures the migration of some supposed plasticizer from the varnish layer to the inner-face surface between the varnish and the plasticized vinyl film? A. Not precisely. I would say that this is an indication of the resistance of a vinyl chloride material

plasticized with these items on such a lacquer, and I suspect, in spite of the wording on the preceding page, that is why this table is labeled "Marring of Lacquer by Plasticizers."

563 Q. Well, do I understand that you are saying that it is still your view that Paraplex G-40 and Paraplex G-25 do not migrate from a vinyl film? A. Substantially, yes.

Q. You say it does not migrate? A. That is, their migration is so slow that, as a practical matter, it often does not take place at all.

Q. Depending on what the plasticized vinyl film is in contact with; is that correct? A. Yes; and, of course, many other factors.

The Court: Explain what the first part of the paragraph, "Migratory Tendencies," means to you. Read it out so the reporter can get it.

The Witness: "The migration of a plasticizer from an elastomer into a contacting surface apparently proceeds in a highly complex fashion, the mechanism of which is not yet fully understood. It appears, however, that the rate of diffusion of the plasticizer out of the elastomer and into the contacting material is the principal factor in migration . . ."

May I comment there?

The Court: Go on and read the sentence, and then you can comment.

The Witness: (Continuing)" . . . and is a function
564 of time, temperature, and the pressure between contacting surfaces. Compounds of very high molecular

weight, such as the Paraplex plasticizers, are of low mobility and, consequently, show quite low diffusion rates. Often, indeed, even when the plasticizer functions as a solvent for some component of the contacting surface, virtually no migration occurs as long as the plasticizer is of low mobility."

That is the end of that paragraph.

565 The Court: What did you want to explain about it? A. Well, there is a minor difference in my opinion in this because I feel quite strongly that the thing that moves normally is the light molecule and the thing that stays put or has more of a tendency to stay put is the big molecule. However, I would also agree with Mr. Kinney that the better the receiving surface, the better solvent the receiving surface is for the plasticizer, the more tendency there will be to migrate.

Q. Well, whether this book is correct or in error, on page 25 there under the heading of "Migratory Tendencies", it does speak of the migration of a plasticizer doesn't it, and Paraplex G-25 and G-40 are plasticizers? A. Not only that, your Honor, but it says from the polyvinyl chloride film into whatever it is in contact with. Now, my own belief is that the little molecule is the one that causes the trouble and the big one doesn't move very much, but this states that migration from the elastomer into the contacting surface, and it intimates that, or at least it is my opinion, that the more the contacting surface is compatible with the plasticizer, the faster the plasticizer will move into it.

Q. Well, if I understand you then, there isn't anything that migrates from the Paraplex G-25 or G-40? A. In the big molecules, no sir.

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569 Q. Well now, Paraplex G-25, according to the Rohm & Haas literature, has a number average molecular weight of about 8000. Is that right? A. I believe so.

Q. And Paraplex G-40 has a number average molecular weight of about 6000? A. I believe that's correct.

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570 Q. Do you know what the weight average molecular weight of G-25 or G-40 is? A. No I don't.

Q. Have you ever made a molecular distribution study on either of those materials? A. We have fractionated them at times, but I would not say that we had made a molecular weight distribution study.

Q. What kind of fractionations have you ever made of G-25 or G-40, just briefly? A. Separation into two fractions. I don't recall that we have ever cut more closely than two fractions.

Q. A more liquid and a more viscous fraction. Is that the basis of separation? A. A more viscous and a less viscous fraction.

571. Q. And a more liquid and a less liquid fraction? A. A more liquid and a less viscous fraction.

Q. How about answering my question. A more liquid and a less liquid fraction? A. Yes.

Q. That fractionation that you did, was that on both G-25 and G-40? A. Yes.

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575 Q. Have you ever seen Paraplex G-25 manufactured? A. No.

Q. Have you ever seen Paraplex G-40 manufactured? A. No.

Q. And you've never made a molecular distribution curve for either one? A. That is correct.

Q. And you have never fractionated them except to roughly divide each into two fractions? A. That is right.

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579 Q. Are you familiar with the book "Principles of High Polymer Theory and Practice" by Schmidt and Marlies? A. No.

Q. Published in 1948? A. No.

Q. Are you familiar with the Flory equation? A. Yes I am. I'm not sure about the equation but I'm familiar with Flory's general remarks about—

Q. I'm talking particularly about the Flory equation on the subject of size distribution in linear condensation polymers. A. Yes.

Q. You are familiar with that? A. No.

Q. You are not familiar with the Flory equation on that subject? A. No. I'm aware of it.

Q. Now both G-25 and G-40 come in the category of linear condensation polymers, don't they? A. That is
580 correct.

Q. Now, whether you are familiar with the equation or not, let me ask you if you agree with this statement, and I'm reading from page 107 of this book: "From this equation it follows that at the conclusion of a polymerization reaction, there are more monomers present than any other size molecule". Do you agree with that statement? A. Is this the condensation reaction?

Q. This is a linear condensation reaction under the subject of size distribution in linear condensation polymers.

Now the statement I just read to you I show you in the book, and I ask you if you agree with that statement, and if you have no basis for either agreeing or disagreeing, you can tell me that? A. Yes. I do not agree with this statement as applied to the commercial manufacture of these polymers, for this reason, the commercial manufacture of these polymers is not conducted so that it can be reversible. As the reaction proceeds, the volatile products of condensation are removed and therefore it must be quite apparent that at the end of the resinification and proper auxiliary operations, there can be practically no monomer present, which is confirmed by Mr. Tierney's testimony.

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583 Q. Mr. DeBell, did the building unit in the G-25, the propylene glycol sebacate, have a molecular weight of about 318, or something like that? A. Well, of that order of magnitude.

Q. And the building unit of the Paraplex G-40, the propylene glycol adipate, would have a molecular weight of about that order? A. Of that order, that's correct.

Q. And, in accordance with the Flory Equation, there would be some units in there, the one-unit, the two-
584 unit, the three-unit, and all the way up, wouldn't there? A. Yes, if the Flory Equation were applicable to this product, that would be correct, but you see, by simple analytical methods, that that is not the case in these resins.

Q. But you, as I understand it, have never pursued those analytical methods? A. No. I am now speaking of the acid-number determinations, which is published specifications. You can't have, as simple computation will show, many small units with that acid-number.

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589 The Witness: I don't recall that. I am sure that the two plasticizers, for example, of the Oace system can be blended.

Q. And when they are blended they make a simple plasticizer system? A. Consisting of two plasticizers;
590 that's right.

Mr. Holmes: You are talking about the reissue now, not the original?

The Witness: Yes.

Q. (By Mr. Kinney) And you can blend them in advance; you can tailor-make them, can you not, to get similar results? A. Resin plasticizers of the Oace system?

Q. Yes? A. They can be tailored, and the resin plasticizers of the Oace system and the liquid plasticizers of the Oace system can be blended at any time one chooses.

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591 Q. Now, I understood that to get an equivalent result, using G-40 alone, you increased the proportion
592 of G-40 to 50 parts. Is that correct? A. Well, I would increase the amount of G-40, that is correct. We would have to determine by experiment whether it would have to go to 50 parts or not. I think 50 would be about right.

Q. You think that would give about a comparable result? A. I think it would give tensile and strength characteristics, which were comparable with the two component system which we just talked about, or we could use G-25 and do the same thing.

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595 Q. Now will you turn back to column 5 of the patent, line 21, that sentence which says: "Ethyl acrylate poly-

mer has been found useful as previously noted; this modifier has somewhat less tendency to cause tack loss than does the Paraplex G-25, hence may be used in even greater amounts in many formulations". Now if you were using the ethyl acrylate polymer with DOP, observing what we have just noted about variations in proportions with
596 G-25, how much would you increase the proportions of that acrylate to DOP in view of that sentence?

A. Well I would have to determine that of course by experiment, because so much depends on the ethyl acrylate polymer.

Q. In other words, the conventional ethyl acrylate polmers which would be somewhat comparable in physical properties to these G-25 DOP mixes we are speaking of, are the ones you would try. Is that not true? A. Yes, I would take these mixtures and merely run the Paraplex G-25 up.

Q. Or run the ethyl acrylate up? A. Excuse me, you're correct, run the ethyl acrylate up.

Q. And make a few simple tests, trying 5 to 1 ratio or 10 to 1 ratio? A. No objection.

Q. That would be a straightforward thing to do would it not? A. A very simple operation.

Q. And then would you run one more so that you would see, in view of the fact that the ethyl acrylate polymer doesn't have this surprising effect of killing tack to the extent of G-25, what would happen if you went all the way? A. Well, if I tried that and did it, I would figure that I had then found something new over the patent because
597 that has already taught me that alone the ethyl acrylate polymer does cause loss of tack.

Q. Well, it says that it doesn't cause it to the extent that the G-25 but—to the extent that G-25 of that vintage would cause it? A. Well, I read line 23 that it has less tendency to cause tack loss. Did you mean to eliminate the tack loss?

Q. In making a few of these simple tests and increasing the proportion of ethyl acrylate to 10 to 1 or higher, where you observed no significant tack loss, it would be apparent to you that you were not in trouble yet. Isn't that right? A. If we had made those experiments, and if we had made that observation, yes.

Q. And would you try 100 to 1 ratio of ethyl acrylate polymer to DOP? Would that be a fairly normal thing to do in running some of those simple tests? A. Yes.

Q. Now if you still observed no tack loss there, wouldn't that suggest to you to go that other short step and forget the DOP entirely? A. Oh, I think so.

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604 Q. Isn't it true that the Bierbrauer patent nowhere addresses itself to any migration problem? A. It shows that it is conscious of the effects of migration, in the statement at the end of the fifth paragraph: ". . . . and retain their pressure-sensitive properties practically undiminished without any influence on the base material by the adhesive."

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Q. Which paragraph, now, are you reading from? A. On your translation it is the top of page 2—" . . . and retain their self-adhering properties practically undiminished without any influence on the base material by the adhesive."

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. . . Now, does that tell you anything about solving the

problem of migration? A. No, it merely says that he has solved it.

605 Q. But he doesn't bother telling you how, does he? A. No.

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... What did Bierbrauer teach on the subject of preventing migration, that you don't find in Schmidt? A. He states he overcame it.

Q. But he doesn't tell you how, does he? A. No.

606 Q. Not a single word about it? A. That is right.

Q. He does no more in that regard than to gloss over a problem. Is that right? A. No, he states that he has solved it, in a published record.

Q. But you find nothing in Bierbrauer which tells how to solve that problem of migration? A. No. I find merely the record that it has been solved.

The Court:

Q. And on that you rely in the last sentence in that paragraph on page two? A. Certainly, sir.

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608 Q. Now do you know who Dr. Beavers is? A. I'm acquainted with him.

Q. Is he the chemist who was regarded by Rohm & Haas as knowing most on the subject of the Paraplex G-25 and Paraplex G-40 plasticizers? A. I think so.

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609 A. My understanding is that the vacuum stage of a process is for the removal of any volatile materials, or also that most of the water has come off before the vacuum stage process occurs.

Q. Well, do I understand you are taking issue in some respect with Dr. Beavers? A. Not in any material respect.

Q. Well, in any respect at all? A. I am saying that the water comes off first, that the volatiles come off during the vacuum stage.

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611 Q. I understood you to say that you have never seen Paraplex G-25 or Paraplex G-40 manufactured? A. That is correct.

Q. And you don't even know the nature of Rohm & Haas' equipment used in manufacturing those products, do you? A. Yes I do.

Q. You do? Have you seen it? A. Yes.

Q. Have you ever seen the operation through? A. Not the manufacture of G-25 and G-40.

Q. Well, I just want to be sure I understand you. You do take issue then with Dr. Beavers in that statement? A. No. Dr. Beavers says he doesn't know, and I agree with him if he says he doesn't know.

The Court:

Q. If I understand you, you think you do?

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612 Q. Have you ever made a study of the problems involved in making a separation on a molecular weight basis of either Paraplex G-40 or Paraplex G-25? A. No, because once the G-25 and the G-40 is made, and has been properly stripped, it is no longer distillable.

Q. So, whatever is in it cannot be separated by distillation? A. Whatever is in it when it is properly finish-

ed, cannot be separated by distillation, which I have personally verified.

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620 Q. Notwithstanding Professor Flory, of Cornell University, and notwithstanding Dr. Beavers, who knows more about this subject than anybody else, at Rohm & Haas, you say you believe it's a fact? A. I'm quite sure that if—Yes, in answer to your question—I'm quite sure that if I pointed out my conclusions to Dr. Beavers, that he would accept them. I'm not aware that Flory has ever talked about G-25 and G-40.

Q. Well, he talked about linear polyesters in general, didn't he? A. I know.

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623 Q. Now, these plasticizing materials we have been talking about in connection with this Oace patent in this plastic tape, when they plasticized the vinyl chloride polymer or copolymer, it is a physical plasticizer. Is that correct? A. Yes.

Q. And in respect to this problem of migration, portions of the plasticizer migrating from the vinyl film to the adhesive layer, that is a physical function again is it not? A. Yes.

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626 Q. Does DOP have any distinctive odor; can you recognize it? A. I think hot, yes; cold, it doesn't have much odor.

Q. Well, at the temperature of your oven which I believe you said was—A. 105 Centigrade.

Q. That would be above the boiling point of water? A. I think I would recognize it as a phthalate, perhaps not necessarily as DOP.

Q. There wouldn't have to be very much of it in the atmosphere for you to be able to notice it; there need be relatively few molecules floating around to affect the sense of smell; isn't that right? A. It would not take very much to be smellable. You can get some idea, of course, by the intensity of the odor as to whether there was much or little.

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627 Q. Now plasticized vinyl films absorb water, don't they, in more or less degree, depending upon the plasticizer system employed? A. In my opinion, these films adsorb water.

Q. All right, adsorb. And that varies from film to film, depending on the plasticizer employed? A. That's possible.

Q. And, in the oven test that you make, one thing you do is to drive off water that has been adsorbed? A. That's right.

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628 Q. Well, I understood, at page 501 of the transcript, that you were taking issue with the reliability of Mr. Tierney's sample. Am I in error on that? A. I am not taking issue; I am merely saying that it contains a volatile material, a highly volatile material.

Q. And can you identify the highly volatile material? A. We made no effort to, beyond noticing that there was a strong ethyl acrylate odor and that the material was volatile.

Q. Well, you would expect an ethyl acrylate odor with an ethyl acrylate plasticizer, wouldn't you? A. Not if it were highly polymeric.

Q. Well, don't you, with those kinds of polymers, always

get some odor at higher temperatures? A. This wasn't at higher temperatures; this was at room temperatures. I smelled the sample right here in the court room.

Q. And you noticed an odor here in the court room? A. Yes, at the time when we had the previous hearings. That is why we went to this trouble. The odor was strong enough to lead me to wonder if there were not monomer present.

Q. Well, can't you detect an odor with dioctyl phthalate plasticized vinyl film at ordinary room tempera-
629 tures? A. Oh, it is detectable, but very faint; and, if the film has any age, it is undetectable.

Q. But ordinary, vinyl goods, like raincoats, they have a very distinctive odor, don't they? A. Yes.

Q. So that doesn't mean that anybody left some volatile solvent in the raincoat, does it? A. No.

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633 Q. Now with a material like dioctyl phthalate at a temperature of 80 degrees C. in these 4-mil films, there will be a weight-loss of about one per cent per day; is that correct? A. That's right.

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634 Q. Now how would the molecular weight of dioctyl phthalate or dibutyl sebacate compare with the weight of the monomeric ethyl acrylate? A. Those are much heavier than monomeric ethyl acrylate.

Q. Now you would expect, therefore, that the monomeric ethyl acrylate would be lost even more rapidly under those conditions of elevated temperature in films of that type? A. Yes, with due allowance for the amount of ethyl acrylate that's in. If, for example, you have 35 percent of

ethyl acrylate monomer in the film, I would expect that the loss would be more rapid than these curves.

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635 The Court: You are now smelling what exhibit?

The Witness: Exhibit T-20, Paraplex G-40 has a very slight odor.

Q. (By Mr. Kinney): Now does that indicate that there is some very low molecular weight material in that Paraplex G-40 to you? A. That indicates that there are enough molecules of low molecular weight material to be sensible to the nose, and I would say that there might be as much as one one-thousandths of one per cent, at a guess. That is not an analysis, but a range one way or another of some odor body.

Q. So, just in the same way as you detected some smell from this Tierney ethyl acrylate tape, you detect some smell from the Paraplex G-40? A. I do.

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645 Q. Now down in that paragraph there you will see the statement: "Research investigators, therefore, focused their efforts on tailoring plasticizers to meet specific, often stringent, application and process requirements." You notice that? A. Yes.

Q. Do you agree with that? A. Yes.

Q. And later it says "Compounders of vinyl products are now able to choose from a variety of plasticizers ranging from simple monomeric esters to complex, high molecular weight polymers such as the Paraplex series of polyesters." Do you notice that statement? A. Yes.

Q. And that is a correct statement, is it not? A. Yes.

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648 Q. Does not Dr. Reed have a very favorable reputation in scientific circles for his knowledge in the field of polymers? A. I think he is well informed.

Q. I would like to refer to Dr. Reed's deposition which is part of the New York Depositions taken on April 20 and 22, 1955, page 20 of the Reed deposition—

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Q. I show you my copy. I refer you to Dr. Reed's testimony at page 20, where he said—well, there was a
649 question up here at the top which reads: "Let's assume that they have dissimilar chemical characteristics in a different molecular weights. Can you predict with any degree of assurance what their behaviour will be in polymers or admixed with polymers?" Then there is some colloquy and then there is this answer: "A. In comparing materials which differ both in chemical composition and in molecular weight, the molecular weight value only would give very inadequate information for predicting properties." Do you agree with that answer? A. Yes.

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651 Q. Will you turn first to the Groff patent. Now, it does not disclose anything in respect to pressure-sensitive adhesive tape, does it? A. No. This deals with the vinyl, stretchable plastics, and plasticization.

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652 Q. That rainwear was made generally like these vinyl films described in this patent, was it not? A. It was, in that it used vinyl resins, but it used higher molecular weight vinyl resins, and it used different plasticizers in the rainwear, but still of the same general nature and for the same purpose. The ratios were a little different from these examples.

Q. One of the purposes described in this Groff patent as I read it, is to make moisture-proof packaging films. You noted that in there didn't you? A. By that I presume you refer to example 10?

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653 Q. But there is nothing there in respect to how to make a pressure-sensitive tape. Is that correct? A. That is correct.

Q. Now, will you refer to the Drew patent, No. 2177627? A. Yes I have it.

Q. Does that mention vinyl resin backings in connection with pressure sensitive tape? A. I'm glancing hurriedly through this. I do not notice a vinyl film example or reference.

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654 Q. Well now, first of all, the patent has nothing to do with vinyl films at all does it? A. That's correct.

Q. And therefore it has nothing to do with migration of plasticizers in vinyl films? A. That is correct.

655 Q. The film primarily stressed in making the tape of the patent you have before you, is plain transparent Cellophane is it not? A. Yes. On page 2, the first column, line 16—excuse me. That's waterproofing cellophane. Yes, you're correct.

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656 Q. All right, now let's turn over to the Maibauer patent, and if you look at page 3 of that patent, beginning in line 16, you will see this sentence: "Thus the tape is characterized by such a dry surface at room temperature that it does not adhere to a person's hand and can easily be wrapped on a rack, yet at elevated temperatures,

say from 100 degrees C. to 140 degrees C., or when wet with an adhesive or a solvent for the low molecular weight polymer, one surface of the tape will seal against an overlapping tape surface effectively to prevent leakage of the electrolyte between the two surfaces." You notice that wording do you not? A. Yes I do.

Q. Now, you don't say that this patent concerns making a pressure-sensitive adhesive tape do you? A. No. This merely tells us what we should use for the backing of such a tape.

Q. Does the patent purport to teach how to make backing for pressure-sensitive adhesive tape? A. No, it teaches a type of composition which would be suitable if one wanted to make a stretchable, retractable vinyl backing for such a tape.

657 Q. How does Maibauer plasticize the vinyl film? A. Among other things he mentions, on page 2, the second column, line 65, as plasticizers in the next ten lines, triphenyl phosphate, organic phthalates, and organic phthalates.

Q. And he illustrates some of those organic phthalates does he? A. Yes.

Q. Are all of his plasticizers of the migrating type, as you view that denominant? A. Yes.

Q. Well, he doesn't help you with the backing for making pressure-sensitive vinyl plastic tape does he? A. He doesn't help us with a solution of the migration problem but he does tell us generally what type of resin and plasticizer may be used for initial trials.

Q. He doesn't suggest that you even use those for initial

trials in making pressure-sensitive tape does he? A. No, just tape. Wrapping tape.

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Q. Now, will you turn over to the Sears patent,
658 2413673. Do you have it before you? A. Yes.

Q. Now, does that patent have anything to do with pressure-sensitive adhesive tape of any kind? A. This has primarily to do with tape, vinyl tape, without pressure-sensitive adhesive, although he brings into the constructions, inner coating of the nature of the coatings used in pressure-sensitive adhesives, at least containing rubber, column 3, line 5, so that he would suggest materials of the type which have since proven useful in adhesives of the pressure-sensitive type.

Q. Which part of the patent are you referring to? A. I am referring to column 3, line 4, "An inner coating of such insulation as asphalt, pitch, rubber or other material may be used in combination with an outer insulation of my new composition."

Q. The whole patent is concerned with insulating electrical conductors is it not? A. Yes.

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659 Now, the only other cited patent which I believe
660 you talked about in your direct examination was the Bierbrauer Swiss patent that we've been over? A. Yes. At least we did talk about that patent.

Q. That patent says nothing about making an electrical tape does it? A. I think it does. Just one moment. I don't find a reference to electrical tape in Bierbrauer.

Q. I think we've already been over this, that the Swiss patent expresses an appetite but leaves you on your own

to satisfy it. Is that right? A. Well, it says that the patentee has satisfied his appetite, but he leaves you to your own natriment.

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662 Q. Now Mr. Harris, as the record will show, asked Mr. Danovitch: "Make me a roll of plastic tape." This was in the summer of 1948. Had Mr. Harris asked you to: "Make me a roll of plastic tape", how long do you feel it would have taken you to do it?

The Court:

Q. Can you answer that now without the aid of some of the knowledge you have gained since then? A. I don't know, but I'll do the best I can, your Honor. I would say, without knowing the pressure-sensitive art—now remember, I did know at that time, the vinyl art,—but without knowing the pressure-sensitive art, I would say that it might take me somewhere between six weeks and four months.

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664 A. A resin is a synthetic or natural material which is viscous or solid at normal temperatures, at room temperatures, that has some appearance characteristics—I can't do that. I was going to compare it to rosin but I can't limit it to that, and which has some amorphous characteristics. Even that is not a good definition because stretched polyamid is a resin and it—it still has some amorphous characteristics.

Q. Are some resins crystalline? A. Yes. There are crystalline elements, especially in oriented synthetic resin. The abietic acid which we take out of resin, can be crystallized. Whether it's resin by the time it's taken out or not,

I should hate to specify. At least there is an amorphous characteristic or a possibility of it with the materials that I am thinking of.

Q. Are resins necessarily polymeric or may they either be polymeric or non-polymeric? A. No. Resins got their name from the Naval Stores industry and there are at least some monomers involved there or monomers can be
665 made from such materials.

Q. So they need not necessarily be polymers? A. No. They usually are.

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A. A plasticizer is a material added to high polymers, to adjust the physical characteristics primarily with regard to temperature.

Q. Or to modify the flexibility of such materials? A. Yes, but most of those materials at a higher temperature may well be flexible, and it brings down—in many cases it brings down the flexibility characteristic to room temperature.

Q. Now will you define polymer please? A. Polymer is a chemical material which contains recurring units.

Q. May you have high molecuar weight polymers and low molecular weight polymers? A. Yes.

666 Q. May you have polymers which are resinous or non-resinous? A. I'm trying to think of polymers which are non-resinous. I presume there are some. I presume, yes.

Q. Now next will you please define ester? A. An ester is a chemical material which contains the linkage bond CO bond OC bond.

Q. May it be defined perhaps a little easier for the average person by saying it is the reaction product of an organic acid and an alcohol? A. That is proper.

Q. Now in the ester field, not all esters are plasticizers are they? A. No.

Q. Many, many esters are not plasticizers. Isn't that correct? A. Yes.

Q. When you talk about esters which are plasticizers, you confine yourself to just one segment of the field of esters? A. That is correct.

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667 A. A polyester is an ester which has recurring units of the same type in the molecule.

Q. The next question, do you have a theory as to why the Paraplex G-25 of 1944 and 1945, would not work as the sole plasticizer in making up a pressure-sensitive stretchable and retractable tape? A. No. It is my opinion that that plasticizer makes a perfectly good tape.

Q. But you didn't try it at that time did you? A. Not at that time.

Q. And you have never made a tape with it since have you? A. Yes.

Q. Well, I misunderstood you yesterday then. I understood you had not? A. I have made tapes from, as you heard, samples of G-25, of 1945, 1951 and current.

Q. Pressure-sensitive adhesive tapes? A. No. Those were the vinyl tapes.

Q. But you never made any pressure-sensitive adhesive tape with the G-25 of 1944 or 1945 at any time have
668 you? A. No, that is correct.

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Re-cross Examination

By Mr. Harold J. Kinney:

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676 Q. Now you say you have been a consultant for Rohm & Haas for a period of time. Can you fix a little more accurately when you commenced your consultantship? A. I believe it was in 1946.

Q. Can you fix the time of the year? A. I can't, I'm sorry.

Q. You don't know whether it was the beginning or the end of the year? A. I don't remember.

Q. Did your consultantship ever concern the manufacture of the linear polyesters? A. Yes, but not G-25
677 and G-40.

The Court: Could you state the frequency with which you were consulted by that firm over this period of ten years?

The Witness: Ordinarily I go there regularly, oh, every month or every two months.

The Court: Is that true for the past ten years?

The Witness: Yes, sir.

The Court: Are you consulted with respect to this type of tape at all?

The Witness: On tape, not at all.

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678 Q. Now do I understand that you are not personally familiar with the manufacturing procedures in respect to any of those Paraplex plasticizers that we have just identified? A. I would so say.

Q. Now I understood you to say in your redirect there were no migrating problems in this tape that we are talking about? A. Yes. I was referring there to the tapes which are now on the market in large quantity in which the migrating problems have, in my opinion, been solved.

Q. You say there are no migrating problems because the problems have been solved; is that what your ans-
679 wer meant? A. In the tapes which are here under discussion, that's correct.

The Court: I am assuming that, by that answer, you mean that there were migrating problems involved until they were solved.

The Witness: Of course, Your Honor, there were grave migrating problems until they were solved, but that is all over now.

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Defendant's witness **Walter M. Bieringer:**

Direct Examination

By Mr. Hector M. Holmes:

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682 Q. Do you know if there were samples of it in your factory; did you have a sample; did you see one? A. Oh, I'm sure that I had occasion to see samples as I went around.

Q. And do you remember if the subject-matter was discussed by you with other officers of the company from time to time? A. Yes, I feel certain that I discussed it with the President of our company so that he would know about it, and I discussed it many times with our sales force through-

out the country when they came to the plant or when
683 I was out, because naturally they ran into it also.

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684 Q. Did you then instruct them to go right forward and make a good, merchantable tape? A. I wanted them to make one as soon as they could.

Q. Were your first samples satisfactory, that you got from the factory end? A. No, from the point of view of appearance, they were rather poor, I thought.

Q. And was the poor appearance, as time went on, rectified? A. Yes, but it took quite some time.

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691 The Court: The objection of plaintiff to the introduction of this letter bearing date August 23, 1950, on the ground that Danovitch, to whom it was addressed, was specifically inquired of concerning it and that he stated definitely that there was no such correspondence for the period between 1948 and 1950, and counsel for the defendant not having notified the plaintiff of the discovery of the letter until it was offered in evidence here near the end of the trial, the Court sustains the objection on the ground that it has the effect of taking the plaintiff by surprise and giving it no opportunity now to prepare to meet the situation; and the defendant excepts to this ruling.

Now you can let it be marked to go in the record, if you want to. You can leave it here, but I am going to
692 exclude it on that ground.

Mr. Holmes: Yes, sir, I will have it marked for identification, Your Honor.

(The document referred to was marked as Defendant's Exhibit 68 for identification.)

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Cross Examination

By Mr. Harold J. Kinney:

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700 Q. What were the sales on this tape in the year 1950, to the best of your recollection? A. May I ask
701 a question your Honor? Did you say that I had to answer as to our volume, as we never wanted to tell our competitors what our volume was?

The Court: I can't help it. You are now involved in a case which makes it necessary. A. All right, sir. I have some figures here. I haven't got 1950. I might say this, that 1950 and 1951 were so small that we didn't bother with any figures. It amounted to practically nothing. It was very, very small, and my sales figures, I have not got my sales figures. I have the amount of poundage mixed for those years.

Mr. Kinney:

Q. For 1950 and 1951? A. No.

Q. For 1952 and 1953? A. Yes, sir.

Q. Would you give us those figures, and Mr. Holmes will have the sales figures, I assume?

Mr. Holmes: You know we haven't got the sales figures for 1951, 1952 and 1953. We've been into that a hundred times in Boston. We had our witnesses and you examined them, and the production figures were destroyed in the regular course of business for those years, and we had our poundage figures.

The Court: Go ahead with 1952 and 1953.

702 A. In 1952 we mixed 150,736 pounds. In 1953 we mixed 228,532 pounds.

Mr. Kinney:

Q. Now in that 1952 production, can you roughly translate that into sales for us? A. Well, I would say that it's under $400,000.00 in 1952 and in 1953 it was more, so that would be around a half million dollars.

Q. And 1951 and 1950 were very small? A. Practically nothing.

Q. Did you have any sales at all in 1950 that you know of? A. Probably at the very end of 1950 we had some sales in small quantities, but very small. A hundred rolls here and there.

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Defendants' Witness **Frank L. Kozol:**

Direct Examination

By Mr. Hector M. Holmes:

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708 The Court: I can't see how his getting insurance
709 or not getting insurance really has anything to do with the Plaintiff's failure to act, or laches on the part of the Plaintiff. You don't have any way of showing that this was communicated to the Minnesota Mining people?

Mr. Holmes: Oh no.

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714 Q. Well now, when was this insurance taken? A. The insurance was taken out in the Fall of 1950.

Q. In the fall of 1950? A. Yes sir.

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717 Q. In other words, you carried it a year after you knew that you were not infringing, according to these reports? Yes sir.

Q. Did you change the policy? A. No sir.

Mr. Holmes: Two years.

Q. Your first policy was against named patents, wasn't it? A. We only had one policy sir, and that was against named patents.

Q. It named a group of patents, among which could not have been the patent in suit? A. That's right, although the patent in suit was added to that policy.

Q. Carried for a year? A. Two years.

Q. Carried for a year after you knew about the patent? A little over a year? A. It was carried from the late summer or Fall of 1951 until the Fall of 1953.

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718 Q. You got one from Fish, Richardson and Neave, and then you got one from the Kenway firm when you took out insurance, and then you got another report? A. I got two others in 1951, one from Fish, Richardson and Neave and one from Kenway on the patent in suit. That was in 1951. We then carried that insurance for two more years and then cancelled it.

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Defendant Rests

No rebuttal testimony offered by plaintiff

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EXCERPTS FROM DEPOSITION TESTIMONY

Depositions taken by Plaintiff in Boston, Massachusetts, commencing February 9, 1955

Excerpts from deposition of **Morris M. Danovitch,** chief chemist of Plymouth Rubber Company, Inc. since July, 1924:

Direct Examination

256 Q842 Now you say you may have looked at some of this Minnesota Mining literature and examined the "Scotch" Brand No. 33 electrical tape before you started your laboratory work, perhaps somewhere around the late spring of 1948? A. Yes. When I said Minnesota data, I had reference to the pamphlet that Carbide & Carbon put out.

Q843 At around that time? A. Yes.

Q844 What was the nature of that pamphlet? A. It was one of their circulars that they put out called "Kabelitems." It is a sheet they put out periodically. They mention products that are on the market. It is about letter-size like those things are.

Q845 Do you have a copy of that pamphlet? A. Not with me.

Q846 Do you have it at your office? A. Yes.

Q847 Now that is something that you had at the time this project was born at Plymouth of going into this pressure-sensitive plastic tape business? A. I have it in my files.

Q848 At that time? A. Yes.

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258 Q855 Let us correct it. Is there any doubt about that? I understood you to say that you did have rolls of "Scotch" Brand No. 33 electrical tape there when this idea of going into this plastic tape business was born at Plymouth Rubber Company? A. Yes.

Q856 That is what I thought the answer was. A. Because I told you the other day that it was readily procurable.

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504 Q2028 Have you been receiving literature from Rohm & Haas on various plasticizers for vinyl chloride resins since the year 1944 or earlier? A. Yes.

Q2029 Now I understood you to say in your earlier testimony that in some of your experimental work in connection with this pressure-sensitive vinyl plastic tape you tried out some mixtures of Paraplex G-25 and dioctyl phthalate in the plasticizing of vinyl chloride polymers, is that right? A. Yes.

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506 Q2036 You say that you tried that particular blend of ingredients in the plasticizer because of difficulty with G-25 alone? A. Yes.

Q2037 And the difficulty was that the G-25 didn't disperse readily? A. We couldn't process it readily. We always had trouble mixing G-25.

507 Q2038 Do I understand that in relatively recent times you have been able to successfully process vinyl resin plasticizer with G-25?

Mr. Kirkpatrick. Alone, you mean?

Mr. Kinney. Alone.

A. Yes.

Q2039 But you were not able to successfully process G-25 and VYNW or VYNS in 1948? A. No, we were not. We always had difficulty, always had trouble with it.

Q2040 Now did the liquid plasticizer, when present in a less amount than the G-25 in your experimental work, make it possible for you to process such material? A. No.

Q2041 It didn't help the situation? A. No.

Q2042 And you tried varying proportions? A. I don't recall.

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526 Q2127 Now I just have a couple of summary questions here, Mr. Danovitch. When you started in on this project back in '48 in this your testimony, that the only things you had to guide you then in your work were this Bakelite pamphlet, Plaintiff's Exhibit 17, sample rolls of "Scotch" electrical tape No. 33, and your prior knowledge of plasticizers and vinyl resins? A. I object to the word "guide." I had that, but I wouldn't say that it was my guide.

Q2128 Well, I will break down the question. Referring to this Plaintiff's Exhibit 17 for identification, particularly to page 2 where the properties of various "Scotch" brand plastic electrical tapes are given, including various properties of No. 22 and No. 33 tapes, weren't you trying to duplicate tape with those properties when you started out? A. I wasn't trying to duplicate it. I was trying to make a similar product.

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Depositions taken by Plaintiff in New York City, New York, commencing April 20, 1955

Excerpts from deposition of **Paul Shalita,** Technical Director and Vice President of Technical Tape Corporation:

Direct Examination

73 Q. What effect would the film have on the adhesive that was significant? A. There are many. One, you have a problem of anchoring the adhesive coat to the film. Two, you have the possibility of plasticizer migrating to the adhesive as used on the film. Third, you have—that's all in relationship to the effect of the film on the adhesive.

Q. What is the effect with respect to the adhesive on the film? A. Again you have the problem of materials from the adhesive migrating to the film, and the problem of anchoring the adhesive to a given film.

74 Q. Was this plasticizer problem the most acute one as you saw it? A. Generally, yes.

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Q. You did have the effect that sometimes your adhesives went virtually tack-free in some of the tests you made? A. Yes.

Q. What did you attribute that to? A. This would only be my personal observations on it. I felt that the adhesive had a greater compatibility for the plasticizer in the
75 vinyl film than the vinyl resin itself did, and, therefore, the adhesive would cause an oozing or an exudation of the plasticizer from the vinyl film.

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Redirect Examination

98 Q. Do you know that some of the most common forms of vinyl chloride polymers or copolymers have been on the market since the mid 30's or earlier? A. I don't understand what you mean by "common forms."

Q. Common trade designations, some of the more popular ones. A. I can think of two that are, I'd say, in the late 30's. One would be "Vinylite."

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99 Q. In your examination by your counsel, I understood you to say that hundreds of materials can be used as plasticizers for polyvinyl chloride. Did I correctly hear you? A. I think I said I thought there could be hundreds. I wasn't certain of the number, but there were many.

Q. Have you known that to be a fact for quite a period of time? A. Well, I have known that many—and
100 again I cannot say whether it is hundreds—but many materials can be used as plasticizers for polyvinyl chloride or its copolymers.

Q. Was that knowledge in the art just recently or for quite some time? A. Oh, I think it's for quite some time.

Q. For how long a time, 15 years, 10 years, 5 years? A. If we don't limit it to hundreds but to many, I would say approximately 15 years.

Q. Could you name some of the major plasticizers among the many that were known 15 years ago?

Mr. Spille: I don't know what you mean by "major". I think that's not clear.

Mr. Kinney: Well, any that are known to the witness. A. Various phthalates, such as dioctyl phthalate.

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101 Q. In referring to these many materials which were available to plasticize vinyl chloride polymers or copolymers fifteen years ago, some of them were
102 liquid materials and some of them were resinous materials, is that right? A. Yes.

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Excerpts from deposition of **Marion C. Reed,** chemist employed by Bakelite Company:

Cross Examination

17 Q. When you say it is presumed to have a higher molecular weight, you have some basis, I'm sure, for that presumption. Could you estimate roughly the order of the molecular weight of these two resins? A. I would hesitate to do so because experts on the subject have differed by a factor of 2 in their assignment of molecular weight values on the basis of viscosity.

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20 A. In comparing materials which differ both in chemical composition and in molecular weight, the molecular weight value only would give very inadequate information for predicting properties.

Q. Is a resinous material necessarily liquid or solid? A. It may be either.

Q. And is a polymer necessarily liquid or solid? It may even be gas? A. It may be liquid or solid, but I know of no gases which might be considered polymers.

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33 Q. I'll try to be more specific. Among the plasticizers which have been used commercially in vinyl films, I'm confining myself to the monomeric type, can you tell us what the range of molecular weight of such monomeric plasticizers has been? Let's take the lower limit first. A. The lower limit would be in the range of approximately 400.

Q. That's the lower molecular weight for monomeric plasticizers? A. Yes. Below that most materials would be too volatile to be commercially satisfactory.

Q. What would be the upper limit? A. We come there to a controversial point on what is polymeric and
34 what is monomeric, and that cannot be answered in one sentence. Perhaps you can lead up to it in some manner.

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35 A. Give me a moment. Without resorting to a search of the literature or calculation of molecular weights, a figure in the vicinity of 1000 is as high as I could recall as being a monomeric plasticizer. There may be others above that that I don't think of at the moment.

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36 Mr. Spille: I was asking about a monomeric plasticizer having a high molecular weight, what is the highest.

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Q. Did I make myself clear in this colloquy what I was asking for? Was your answer based on the same understanding? A. I understood it as you stated it. I am not at the same time saying that that is a dividing line between monomers and polymers.

Q. I understand that. You are picking, now, a range, and your upper limit is certainly within a safe limit.

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Q. The answer to my prior question wherein you indicated that a molecular weight of about 1000 was about the upper limit of plasticizers for vinyl films which you can unhesitantly characterize as monomeric. You picked number 1000 as being a safe number, not open to debate, whereas you recognize that there are materials of higher molecular weight than 1000 which may or may not be monomers. A. I think you are restating my answer in a somewhat different manner. I intended to convey that I believe that examples of monomeric plasticizers could be found as
37 high as 1000 in molecular weight. But I do not believe that that constitutes any division line.

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Depositions taken by Defendants in Philadelphia, Pennsylvania, commencing March 21, 1955

Excerpts from deposition of **Louis Klein**, chemical executive and vice president of Rohm & Haas Company:

Cross Examination

134 A. Well, normally, for instance, when we start manufacturing a new product we set up a range of specifications that are a compromise between what the sales department and the laboratory want on one hand and what the manufacturing department thinks it can produce on the other hand. And such specifications as acid number, viscosity, color, are drawn within as wide limits as is considered feasible to give manufacturing latitude. As we obtain experience there is a tendency to narrow those limits as experience shows that it can be done, or as manufacturing improvements are made that make it possible to do

that. After all, we are talking about resins, we are not talking about chemical compounds, and they are defined by the specifications which we set.

XQ400 Did a similar situation apply in respect to Paraplex G-25? Were those specifications narrowed as your manufacturing experience progressed? A. Again I think that is a better question to put to Mr. Blount, but I would suspect that that is probably what happened, because that is almost normal in the development of a new resin.

XQ401 But except for those narrowing of specifications, basically G-20 is the same today as it was in 1930 or 1935? A. I would say so.

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A. I would say that where a product is rather new and rather different, normally we would expect to narrow our specifications after commercial experience. That would be less likely to be the case with a material very similar to something we made before or something on which we had experience.

XQ416 Well, now, was G-25 the type of material which you would expect that there would be some narrowing of specifications on? A. Yes, it was because it was substantially different from anything that we had made before.

XQ417 And you first offered G-25 in the latter part of '43, is that right? A. That is the best of my recollection from the reference to our sales literature.

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XQ424 Is material having a molecular weight around 1,000 a polymer? A. It could be, depending on the material.

XQ425 Let's talk about a material such as G-25. A. My impression is that—at least I have always thought of it as not having material as low molecular weight as that in it.

XQ426 Do you know anything about the range of molecular weight in G-25, as your company first put it on the market? A. No, I do not.

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Excerpts from deposition of **Ellington M. Beavers,** laboratory head in research department of Rohm & Haas company:

Direct Examination

160 Q29 What was the nature of your work, so far as it concerned G-25, in late 1943 and '44? A. Late '43 and '44.

Q30 At the beginning of G-25. A. Well, at that time our work dealt solely with the development of a process for the manufacture of G-25, both on a pilot-plant and a plant scale. By that time the G-25 composition had been defined research-wise at least with respect to its major features.

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162 Q43 In connection with your work with G-25, did you have occasion to use therewith a momomeric
163 plasticizer in polyvinyl chloride or polyvinyl chloride-acetate copolymers? A. Not that I recall. Our primary objective was to evaluate our plasticizers alone and singly in polyvinyl chloride, and I do not recall any work with combinations of plasticizers.

Q44 Do you know whether or not such a mixture of plasticizers was contemplated early in the use of G-25, perhaps for saving expense or for other reasons? A. Contemplated by whom? By us or by a customer of ours?

Q45 Yes, by Rohm & Haas. A. I don't know, no.

Q46 I ask you that because there appears to be in a letter of October 26, 1943, included in Exhibit 49 herein, a reference to employing Paraplex AR-148 in conjunction with a small amount of an ester-type plasticizer.I ask if that refreshes your recollection as to anything that was discussed or that was done at that time on that subject. A. Where is the reference to monomeric—oh, yes.

Q47 Do you find such a reference in that letter? A. Yes, sir. That does not refresh my memory as to any work we did of this kind, no. I am afraid I don't know what
164 Dr. Myers had in mind at the time of that letter. I have not seen this letter since 1943, if I saw it at that time.

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165 A. Well, I remember that our first production scale batch of G-25 was made in early 1944. I believe that is about as close as I can come to it. I believe it had been made by the 1st of May.

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175 Q84 Would you expect them to be alike? A. I think they are pretty similar from the fact that their average molecular weights are so close together. But we have no data on the relative amounts of molecular weight fractions in either case.

Q85 There certainly would be no monomeric material in either of those compositions as sold? A. I can't say that. Particularly I don't believe I know what you mean by monomeric.

Q86 Well, suppose we draw a line of molecular weight material of the order of two, three, 400. Would not your

distillation and checking procedures tell you that there were no such materials included in your products as sold? A. They would not tell us that exactly, no.

Q87 But whatever might be the case with one you say would be the case with the other? A. The two should be quite similar.

Q88 Did you ever fractionate G-25, or attempt to fractionate it? A. We have made attempts along those lines but unsuccessfully. We have never described a dis-
176 tribution curve as a result of our work on fractionation.

Q89 And that is true as to each of those materials, G-25 —A. G-25 and G-40?

Q90 Yes, sir. A. I am glad you asked that. I am not sure that it is true of G-40. I am not sure we have done anything with G-40, come to think of it. To the best of my memory, what we have attempted to do has been with G-25 alone. I think we have not even attempted to fractionate G-40.

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190 A. The vacuum stage of the process for the preparation of G-25 has as the purpose the removal of free glycol and water which may result from the polyesterification.

By Mr. Kirkpatrick:

Q114 Is that conducted at a temperature which tends to remove lower molecular weight material? Are the conditions such that it tends to remove lower molecular weight material? A. I am afraid that in order to answer that I would have to know how low you mean. That is a matter of interpretation, it seems to me.

Q115 Well, suppose we say material of the order of three, four, 500 molecular weight. A. I don't know that it would remove anything that high in molecular weight.

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Cross Examination

210 XQ191 Well, it is never quite 100 per cent, is it? A. No, I am sure that it is not a chemically-pure compound.

XQ 192 Have you observed that in Paraplex G-25 as sold by your company a usual situation is that the otherwise clear material contains some small amount of mushy solid? A. At what temperature?

XQ193 Room temperatures. A. I have never observed that, no, sir.

XQ194 Have you noticed some cloudiness in G-25 as distinguished from a completely clear product? A. Not in a batch which had been properly filtered.

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216 Can you tell us whether Paraplex G-25 as commonly sold by your company is more than 99 per cent an ester of sebacic acid or less than 99 per cent of an
217 ester of sebacic acid? A. No, sir, I cannot tell you that.

XQ223 Can you tell us whether it is more than 95 per cent of an ester of sebacic acid? I mean, one or more esters. I am not being technical on that. I mean of an esterified sebacic acid. A. We haven't determined any such figures experimentally. We react together sebacic acid and the glycol and our product is the polyester derived from those two raw materials. Any deviation from 100 per cent pure sebacate ester would be the result of any impurities that there might be in the raw materials.

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Excerpts from deposition of **Arthur L. Blount**, chemical engineer of Rohm & Haas Company:

Direct Examination

240 Q9 From a letter of January 11, 1944, contained in Defendants' Exhibit 14, for identification, it appears that G-25 was offered for sale as early as said date. I hand you that letter. Can you say whether by said date you were manufacturing G-25? A. I believe that this is before the material was produced in the plant.

Q10 From that do I gather that prior to that time it was produced on a pilot-plant basis? A. I would say that, yes.

Q11 How long did it continue on a pilot-plant basis, if you know? A. The first plant production was in April of 1944.

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Cross Examination

251 XQ44 In plant production when you talked about working within specifications, sometimes you may be just barely within the specifications and sometimes you are well within the specifications, isn't that right? A. Yes.

XQ45 And in normal production the objective is to narrow the specifications or, I mean, to stay well within the specifications as much as you can, isn't it? That is the normal objective in production? A. Well, that is
252 certainly nice when you are right in the middle of a range, as far as that is concerned, and that is what we try to do, that is, is to get right in the middle of the range.

XQ46 And as you develop more production experience with the new product, you do try to stay well within the specifications? A. Yes.

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Depositions taken by Defendants in Boston, Massachusetts, commening June 9, 1955

Excerpts from deposition of **Robert W. Lundbohm**, chemist employed by plaintiff:

Proceedings before Judge Ford

55 Mr. Holmes. He can't pass upon it until he knows what the material is.

The Court. I will never have occasion to do so, Mr. Holmes, because there is no case pending here.

Mr. Holmes. Well, there must be some basis upon which the local judge must order a witness to answer.

56 The Court. I can compel the witness to answer the question without doubt under the rules, but he is going to give the answer that he does not know. Now where are we?

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59 The Court. The other thing is the witness knows nothing about these documents, does he?

Mr. Kinney. He originally wrote this document back in 1951.

The Court. So he ought to know what is underneath there.

Mr. Kinney. He writes many of these documents, your Honor.

The Court. Did he know at one time?

Mr. Kinney. I don't know. I suppose he did.

The Court. Did you know at one time?

The Witness. At the time in 1951.

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Depositions taken by Defendants in Bridgeport, Connecticut, commencing April 7, 1955

Excerpts from deposition of **Irving C. Eaton**, engineer employed by General Electric:

Cross Examination

28 Q. Now, at some stage General Electric was asked to work specifically on the problem of jacketing around a polyethylene insulated cable, was it not? A. It must have been.

Q. I mean, there was a government project on that, was there not, in which Federal Telephone and G.E., and various other companies were jointly engaged? A. Yes, if I remember correctly. There was the problem which
29 was put up to the cable industry, to develop and produce in quantity high frequency cables. Radar was becoming more important.

Q. And that work on putting a sheathing around a polyethylene cable came, I assume, following the decision that polyethylene was the most logical insulation for such cables? A. Yes, I would say so.

Q. And so, following a decision to use polyethylene as the insulation rather than perhaps polystyrene or cyclicized rubber, then a campaign was put on to put a proper sheathing around the polyethylene to give it what, wear resistance and oil resistance and heat resistance, and some of those qualities? A. Well, as the name implies, a protective sheath, a flexible sheath which would give some degree of protection to the underlying polyethylene, the vinyls to give some measure of oil protection, for instance.

Q. Oil protection, protection against wear? A. Could be, yes.

Q. Protection against heat too? A. To a certain extent.

Q. Now, the work of General Electric, with respect to that specific project of putting a sheathing around polyethylene, commenced around the beginning of the year 1944, is that the way I understand it? The witness is referring again to Defendants' Exhibit 55, to refresh his recollection. A. Well, this would seem to indicate it, yes.

Q. Now, if you had been confronted with the same problem in 1935, would you have known how to go about it then? A. 1935?

Q. Yes. A. Well, in the first place, in 1935 we had no—.

Q. Let's say 1935 or 1936, if that makes it easier. A. There were no resins available, such as polyethylene.

Q. Well now, I am asking you to postulate that polyethylene was available in 1935 and 1936, if it were, and you were asked to put a sheathing around it in 1935 or 1936. A. We didn't have the polyvinyl chloride in 1935, 1936.

Q. Oh, I think that Carbine and Carbon were producing it in substantial commercial quantities in 1932, and earlier. You were using it on your Flamenol insulation in 1936.

• • • • • • • • • • •

Q. I will withdraw the last question, and start over again. In your work with these coaxial cables, did you find that some materials, next to the polyethylene, would deteriorate much more than others? A. Well, we and everyone else who was vitally concerned with the business of making high frequency cables found that vinyl jackets of various types would, to use an expression which

I used some time ago, would poison, there would be
36 migration of the plasticizer into the polyethylene,
and therefore then tend to destroy the electrical excellence of the polyethylene itself.

Q. Now, if a plasticizer were about as good in its electrical properties as the polyethylene, then its presence in the polyethylene wouldn't have an effect on the electrical characteristics of the polyethylene, would it? A. In other words, you are asking me to say that a plasticizer, which of itself is good electrically, would not poison or harm the polyethylene, right.

Q. That is approximately my question. A. Yes, I think that is a statement of fact.

Q. So that in a particular instance, if you found no poisoning, then one of two things would be so: Either there was no migration into the polyethylene, or else whatever did migrate into the polyethylene was about as good electrically as the polyethylene itself? A. I would assume that that would be the situation. If you had no deleterious effect, then the electrical values of your plasticizer in question would be satisfactory.

Q. So the mere fact that you had no drop-off in electrical properties of the polyethylene insulation wouldn't do anything more than tell you that one or the other of the two things must be so, namely, either you had no substantial migration into the polyethylene, or else whatever did migrate in was about as good electrically as the poly-
37 ethylene? A. I would say that would be a statement of fact.

* * * * * * * * * *

39 Q. Was that really it at all? Weren't you interested in a sheathing that wouldn't hurt the electrical

properties of the polyethylene? You really knew nothing about its migration, did you? A. You can quickly get yourself into difficulties when you are dealing with new materials. You can find whether you get migration or you don't get migration, and what happens to the material electrically.

Q. What happens to the material electrically when you mix G-25 with polyethylene? A. I don't know. I never tried it.

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48 Q. My question is not directed to possibilities. My question is simply directed to this: You do not know whether, say, five or ten percent Paraplex G-25 in the polyethylene insulation would hurt it in any way or not, do you? A. I would expect that a material like that would do—I don't know what would be gained.

Q. But the fact is, sir, that you don't know, isn't that right? A. I don't know, of my own knowledge, no.

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Depositions taken by Defendants in Saint Paul, Minnesota, commencing January 31, 1955

Excerpts from deposition of **Esther Eastwold LePage**:

Direct Examination

6 Q. Were you ever employed by the plaintiff herein? A. Yes, I was.

Q. And when did you first become so employed? A. It was the last part of June or the first part of July, 1943.

• • • • • • • • • • •

Q. Prior to that, what was your formal education? A. I had just graduated from the University of Minnesota and

obtained a Bachelor of Arts degree, with a major in chemistry and a minor in biochemistry.

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7 Q. You worked until the spring of '51,—at Minnesota Mining and Manufacturing Company? A. Yes.

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19 Mr. Kirkpatrick: For present purposes, at least, Mrs. LePage, I am going to speak of such copolymers by simply calling them vinyl polymers, meaning those high in chloride and low in acetate, or even straight chloride, ...

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Mr. Kirkpatrick: I realize that the term may include more than those two, but will ordinarily include those two.

The Witness: Yes.

Mr. Holmes: Will include at least those two.

The Witness: That's right.

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34 Q. Did you yourself apply coatings to polymerized vinyl backings? A. What kind of coatings?

Q. Any kind of coatings. I'm asking you if you applied coatings? A. Yes.

Q. What sort of coatings? A. Some were adhesive coatings.

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37 Q. Did you have, at the time you started the project, any information as to any attempts that may have been made by the 3-M people with respect to that general subject matter? A. It was my understanding that many people had tried to make a tape that would serve

these end uses of an electrical tape that was stretchable and retractable and remained pressure-sensitive, but there had been no success in the field.

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42 Q. In your use of those monomeric plasticizers to form backings, did you apply pressure-sensitive adhesive compositions thereto? A. I did on some of them.

Q. And for the time being, I'm referring to the use solely of monomeric plasticizers, such as DOP and tricresyl phosphate. Did you subject such tapes to any aging tests? A. Yes, I did.

Q. With what results? A. The adhesive would get pasty and useless.

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44 A. We were trying to make a stretchable retractable tape that would be good for electrical uses, and
45 that's all we were trying to do.

• • • • • • • • • • •

A. I again say we were trying to make this stretchable retractable tape that would have good adhesive properties. We couldn't make a desirable one with the monomeric plasticizers alone.

Q. Did you think the G-25 plasticizer would avoid the pasty adhesive difficulty that you had and that you have mentioned in the use of the monomeric plasticizers alone? A. At that time I wasn't in a position to think anything. I was just trying to make a tape that would be stretchable and retractable, and we were trying many things to do that.

Q. What was your understanding at the time you used the monomeric plasticizers as to the reason for the
46 adhesive going pasty on aging?

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A. Well, it's hard to say what I felt at the time, but we felt that the plasticizer migrated into the adhesive,—plasticizer meaning DOP or monomeric plasticizer.

* * * * * * * * * *

47 Q. Once you started on it, Mrs. LePage, was your work confined to the plastic insulating tape investigation for a matter of some time,—continuing along for a matter of some time? A. Yes, I think so.

Q. And for how long a time, approximately? A. It was more than a year.

* * * * * * * * * *

67 Q. Mrs. LePage, were you the only one, so far as you know, who mixed up these formulations and made small batches of dough and roll tapes? I am speaking of experimental quantities for Dr. Lundquist on this investigation. A. Well, I was the only one working directly for Dr. Lundquist.

Q. In that work? A. In that work, but I'm sure there were others in the company doing perhaps a similar study.

Q. On plastic tapes? A. There was a very great desire to have a tape like that, so that I don't think that the work was all limited to Dr. Lundquist and I.

Q. Well, do you know, for example, whether either Oace or Snell made formulations and made tape therefrom? A. I think they did.

Q. Did they have equipment in their own lab for such work? A. We used equipment in common.

Q. Pardon? A. We used equipment in common.

82 Q. How much aging did tape made with DOP plasticizer only withstand before becoming pasty, as referred to in that first paragraph, in your experience? A. Well, that's—I can't say exactly.

Q. All right, pick 30, pick 40, pick 50. I am just giving you some amount. A. But the pastiness would appear in a very short while. I think under two weeks.

140 Q. Did you sign a reissue application at that meeting you have referred to in the hospital? A. Yes.

Q. This really isn't material, but I have some interest in why you were confined to the hospital. Was that in connection with your youngster? A. No, I had been very ill with a strep infection.

154 A. I am becoming concerned with the question before this.

155 ("Question: Can an adhesive pressure-sensitive insulated tape with vinyl polymer film backing, having the properties described in your patent, be made with satisfactory results using only a viscous, non-mi-
156 grating plasticizer resin, or resins?") A. I think you could get a plasticizing system of non-migrating materials which would be useful.

Excerpts from deposition of

Robert B. Snell:

Direct Examination

167 A. My name is Robert Burn Snell, and I reside at 544 Wildwood Avenue, in the Village of Birchwood, at White Bear Lake, Minnesota. I am employed at the present time by the Minnesota Mining & Manufacturing Company.

Q. And have been since —. A. And have been since July 1944. I would like to back up one minute there. My position today is not the same as it was in July of 1944. I'm technically employed today as a product engineer, and came to the Minnesota Mining Company in 1944 as a laboratory technician.

. . . . . .

168 A. I studied some chemistry at the University of Minnesota and some other technical subjects, and was taken into the Army in May of 1942 and sent to the Midland Radio and Television School at Kansas City, Missouri, where I graduated. From there I was sent to a War Department school at Hobe Sound, Florida, where I was trained in a War Department radar school on United States radar units. Let me say this: My qualifications for being hired at the Minnesota Mining & Manufacturing Company were my early training at the University of Minnesota and my technical war training.

Q. Are you one of the applicants and patentees in this Dace, et al. Reissue Patent No. 23,843? A. Yes, I am —

. . . . . .

Were you asked to bring here with you the earliest papers you could find relating to plastic electric insulating

tapes involving a vinyl polymer backing, pressure-sensitive adhesive coating, and so forth? A. Yes, I think that's correct.

169 Q. And is it also correct that this sheet dated February 21, 1944, SL-8874, was the earliest of such sheets you could find? A. Well, they have had experimental work running on at the Minnesota Mining Company as early as 1935, I believe, on plastic backings, and I didn't search for any of that material and I wouldn't know where to look for it but I know there is information on it. Many people worked on it before I was ever hired by the company.

Q. But so far as your own personal relation, it began in the early summer of 1944? A. That is correct.

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170 Mr. Kinney: I think that the record should show that as far as some of this earlier work is concerned, I have already showed you a copy of SL-4324, signed by H. J. Tierney, back in the year 1938.

Mr. Kirkpatrick: That is true, — what was regarded or called the other day as the Westbee and Tierney early work books.

Mr. Kinney: Hurd and Tierney.

Mr. Kirkpatrick: Yes, Hurd and Tierney.

Mr. Kinney: Now, that was an attempt to make a tape by coating a pressure-sensitive adhesive on a vinyl chloride backing, but an unsuccessful attempt.

Mr. Kirkpatrick: And with a monomeric plasticizer.

Mr. Kinney: I believe so.

Q. (By Mr. Kirkpatrick) Mr. Snell, I call your attention to another document, bearing the designation SL-9556, dated October 9, 1944. Are you the Robert B. Snell whose name appears therein with the typewritten signature
171 at the bottom? A. That correct.

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182 The Witness: Yes, the tape I showed to the attorneys prior to the filing of the application for the patent, Patent No. 2,559,990, was a tape with substantially the same properties as the tape I'm holding in my hand. It had about 150 per cent elongation in the backing. It was composed of a vinyl copolymer, a vinyl chloride and vinyl acetate, with a plasticizer material, and a stabilizer, and a primer, and a pressure-sensitive adhesive coating on the inner side, — coated on the inner side of the film. The backing was in excellent equilibrium with the adhesive. By that I mean that upon aging the tape retained its tack, as we refer to it in the trade, or its adhesion, and did not go tack-free upon aging.

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Excerpts from deposition of

Ralph J. Oace:

Direct Examination

199 Q. You are the Ralph J. Oace, are you not, who is one of the patentees of the Reissue Patent No. 23,843? A. Yes.

Q. Now, Mr. Oace, how long have you been with 3-M? A. Since January, 1937.

Q. And what was your education? A. Bachelor of Chemical Engineering.

Q. And you came right from school to 3-M? A. That's right.

Q. In what division were you first employed? A. In the Tape Laboratory.

Q. And you continued in that Tape Laboratory for some time thereafter? A. Yes.

Q. How long? A. Until the fall of 1945.

Q. Now, it has appeared that early in 1944 a project was undertaken to develop a pressure-sensitive adhesive tape with plasticized vinyl film backing in which the adhesive would not be affected by the plasticizer in the backing and that you and Mr. Snell and Mrs. LePage were associated as a team, so to speak, in working on this project. Is that substantially correct?

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200 A. Well, it all depends on how you describe "team". It was between departments, you see. There was no formal team formed. There was a close association.

Q. Well, there was a close association. And you were brought into it along with Mrs. LePage, is that correct, and Mr. Snell, — at least as soon as he became associated with it?

201 A. Yes. There was some mention in the middle there someplace about adhesive — working with the backing. There were innumerable problems in the construction of that.

Q. Oh, yes, but I'm reading from a report — A. (Interposing) The project was designed to devise a splicing tape.

Q. And at least one of the problems was to develop one

in which the adhesive would not be affected by the plasticizer? A. Yes.

Q. Now, was Mr. Snell a subordinate of yours? A. Yes.

Q. Now, Mrs. LePage has testified and her notes show that she made vinyl film, plasticized it — various formulas — and tested it. What part did you play in the development, along with Mr. Snell and Mrs. LePage? What function did you perform, so to speak? A. Well, I was directing Bob Snell's work and coordinating with the Research Department by way of Esther Eastwold.

Q. What was the nature of Mr. Snell's work under you, — his part of it? A. It was pretty complex. What phase did you want explained?

Q. Well, I don't know what he did, so I don't know what phase to mention. A. He did laboratory work on this particular project.

202 Q. Did he make films and plasticize them? A Yes.

Q. And tested them? A. Using other facilities in the laboratory.

Q. Much the way Mrs. LePage did, is that true? A. Yes.

Q. And would he report to you? A. Yes.

Q. What sort of reports were compiled or made and handed in to your superior, who I presume was Dr. Lundquist, is that correct? A. No, no — that was Esther Eastwold's superior.

Q. Well, to whom were your reports made? A. To Mr. Tierney.

• • • • • • • • • •

208 ("Question: Now, do you find in this patent any suggestion that the use of some liquid plasticizer in the mix is or may be optional? Do you find any suggestion in the patent of that?") A. I think I would have to read this whole patent through in order to be sure to answer that properly.

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Q. (By Mr. Holmes) Well, let's read it.

210 Q. (By Mr. Holmes) Well, I think you had better read the patent, Mr. Oace. A. All right.

(A brief recess was taken in order to allow the witness time to read the patent.)

A. I didn't read it all the way through, but I picked out a few points I think will answer the question.

Q. Yes. A. You will have to remember that this is not a legal answer to this question. It is a laboratory man's answer to the question and consequently it may be

211 a poor interpretation. But in Column 5, in lines 21 to 26, it says: "Ethyl acrylate polymer has been found useful, as previously noted; this modifier has somewhat less tendency to cause tack loss than does the 'Paraplex G-25,' hence may be used in even greater amounts in many formulations."

Well now, I think to a laboratory man that would be a suggestion that the liquid plasticizer may be eliminated.

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213 Q. Well, did you sometime learn or were you informed that in making a tape having the characteristics defined in your patent, a pressure-sensitive adhesive tape with vinyl film backing, some non-migrating resinous plasticizer alone could be used without loss of tack? A. Well, I cited from the specification that in the original

application that there was some indication that a
214 liquid plasticizer would be optional, so that that would indicate that I already knew the answer to that question.

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Excerpts from deposition of
Dr. William E. Lundquist:

Direct Examination

218 Yes, sir. An earlier affidavit by you in this case states that you received a Ph.D. in chemistry at the University of Illinois in the year 1938. What did you do thereafter? A. When I finished at the University of Illinois in 1938, I went to work for the DuPont Company at the Experimental Station in Wilmington as a chemist for four years approximately, and then in the spring
219 of 1942 I came to work for Minnesota Mining.

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221 Q. What was the different work you spoke of as to the Tape Laboratory? A. In 1945 I transferred from Central Research to the Tape Laboratory.

Q. Can you place approximately when in 1945?
222 A. The summer.

Q. Did you continue after your transfer to keep in touch with her as to this work — any contact with her? A. Yes.

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232 Q. Is it correct to say that G-25, G-40, G-50, and G-53 are all resinous modifiers within the meaning of that phrase which appears at Column 3, line 57, of the reissue patent which I hand you?

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A. I would have to say that's one of those yes or no questions. I wouldn't be able to answer it with either yes or no, because it wouldn't be true.

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Q. (By Mr. Kirkpatrick) Deal with them one at a time then.

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A. From one viewpoint they are all polymeric plasticizers but they do not do what it says here in this sentence. This sentence that you referred to reads as follows: "Instead, it has been shown that pressure-sensitive adhesives in prolonged contact with highly stretchable and elastic films consisting solely of vinyl polymer and resinous modifier lose a great deal, if not all, of their initial tackiness or pressure-sensitivity." And certainly with G-50, and G-53 this does not happen. With the G-25, as we purchase it today, this does not happen. With the G-25 as we purchased it in 1944 and '45, it did happen.

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Q. (By Mr. Kirkpatrick) Referring again to page 12 of your affidavit, Doctor, and again at line 8 thereof, I believe you said that you at least saw or supervised the making of that test with respect to G-53, or G-50? A. Yes.

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Q. Do you think that that test there referred to was made for the purposes of the preparation of this affidavit? A. No.

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Q. In the commercial practice so far as you know of 3-M in the manufacture of the tape of this invention, has it always used a combination of two plasticizers,

—one a viscous, non-migrating resinous plasticizer, and the other a plasticizer of the order of DOP, or the like? A. No.

Q. As I understand it, the first experimental production was with G-25 and such plasticizer as DOP, is that correct? A. I believe that's correct.

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250 A. I stated yesterday, I believe, that the G-25 that we originally purchased from Rohm & Haas caused loss of adhesion of the adhesive after tape had been made using G-25 as the sole plasticizer. The G-25 that we purchase from them today has not caused this tack loss and I don't believe I made any comment about G-40.

Q. Do you say that there has been a change in the material G-25 as received at the outset and as received today? A. Yes.

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252 A. Yes; and the two things that we know is that on the early batches when we used the G-25 as the sole plasticizer and made finished rolls of tape, we had loss of adhesion of the adhesive, and we do not get this today.

Q. Was that loss of adhesive also true in 1945? A. I believe so.

Q. In 1946? A. I would not be able to say the precise date or period of time when there was a change, because we weren't necessarily looking for it on each batch as the batches were received.

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EXCERPTS FROM PLAINTIFF'S EXHIBITS

Excerpts from Plaintiff's Exhibit 2—File History of the original Oace et al Patent No. 2,559,990

Excerpt from Patent Office Action of May 11, 1948

33 Claims 3, 4 and 6-9 are rejected as functional . . . .

• • • • • • • • • • •

Excerpts from Applicants' Amendment filed Nov. 8, 1948

36 As previously indicated, the present claims take the place of claims 3-9 . . .

The new claims overcome the rejection on the ground of functionality . . .

• • • • • • • • • • •

37 In thus re-defining the invention to overcome the functionality rejection, . . . applicants do not of course waive whatever inherent rights they are entitled to in respect to the doctrine of equivalency as applied by the federal courts in infringement suits in determining whether or not the defendant is liable as an infringer of the invention.

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THE REFERENCES DO NOT SUGGEST THE CLAIMED INVENTION

39 To properly reject claims to a novel article upon a combination of references, it is hornbook law that the primary reference must disclose a similar article and the secondary reference must suggest the idea of modifying the article of the primary reference so as to result in the claimed article, and this must be evident to persons of ordinary skill in the art without exercise of inventive faculties and without the benefit of the hindsight wisdom

acquired after the claimed article has been disclosed to them by others.

It is also hornbook law that a novel combination resulting in a new article of great value to the art, which fills a need not previously met, is not unpatentable merely because the ingredients are individually old."

Excerpts from Patent Office Action of May 24, 1950

56 Claims 10 and 12 are also further rejected as functional . . .

* * * * * * * * * *

57 It appears that the present application contains patentable subject matter, . . .

Excerpts from Plaintiff's Exhibit 4—File History and Contents of Oace et al Reissue Patent in Suit, Re. No. 23,843

Excerpts from Applicants' Amendment dated January 6, 1953

34 Suppose one attempted to evade the Oace et al Patent No. 2,559,990 by replacing the two plasticizers for the backing, specified in the original patent claims, by a single plasticizer which could combine the function and effect of the two named plasticizers. Would this avoid infringement?

* * * * * * * * * *

36 . . . "it is obvious" that the functions of the two plasticizers could be combined into one (by appropriate application of the knowledge of chemistry) in duplicating applicants' novel electrical insulating tape.

Thus it is submitted that the new claims as a whole are

not much, if any, broader in scope than the claims of the original patent, *when the doctrine of equivalents is properly applied* in determining what will infringe the latter claims. Of course, it always helps in a patent suit to have the matter of range of equivalency argued out in the Patent Office, where possible, so that the claims are *in terms* covering the devices or structures charged as an infringement. That is one purpose of this reissue application.

Excerpt from Patent Office Action of January 22, 1953

55 Responsive to amendment filed January 8, 1953.

1.The denial of the reissue of patent No. 2,559,990 on the ground of estoppel is believed to be proper, and is repeated for the reasons as fully set forth in the Office letter of August 7, 1952, paragraphs 1 and 2.

* * * * * * * * * * *

Excerpts from Affidavit of Dr. William E. Lundquist of May 8, 1953

73 . . . They (the applicants) were concerned with replacing ordinary rubber electricians' tape and friction tape in the insulation of electrical splices. . . . they felt it necessary to tackle the problem basically and apparently visualized that the difficulty in the prior art was that the other people, to the extent that they may have been concerned with the problem, were doing like Schmidt, namely, trying to coat an adhesive on some kind of a conventional
74 vinyl film backing. . . . the plasticizer would migrate from the film and "poison" the adhesive . . .

* * * * * * * * * * *

75 In accordance with the teaching of Oace et al (for example, see the Oace et al specification, page 5,

line 23 et seq.) instead of using 2 parts of "Paraplex G-25" (high molecular weight plasticizer) to 1 part of dioctyl phthalate (liquid plasticizer), where the "Paraplex G-25" is replaced by a somewhat lower molecular weight plasticizer, the amount of liquid plasticizer may be correspondingly reduced or modified, with equivalent results. For example, where, instead of "Paraplex G-25", "Paraplex G-53" or "Paraplex G-50" are used to plasticize the vinyl polymer (Vinylite VYNW), the dioctyl phthalate or equivalent may be reduced or eliminated, with equivalent results. Tape has been made under affiant's directions, using "Paraplex G-50" in one instance and "Paraplex G-53" in another instance, and affiant demonstrated, to his own satisfaction, that the proportion of the dioctyl phthalate or equivalent may be modified as suggested by Oace et al, and can be reduced to zero in such event, with equivalent results.

With every change in the ingredients of the plasticizer material, e. g., with increases or decreases in molecular weight of the more viscous plasticizer ingredient, the proportions of the more liquid plasticizer must be varied accordingly and, as above indicated, under certain circumstances reduced to zero, or eliminated.

* * * * * * * * * *

CONCLUSION

77-78 I can see nothing in the disclosure of the Groff patent which discloses the article described and claimed in any of the claims of the above-identified Oace et al application. I can find nothing in the Kitchin et al patent which discloses the article described in the above-identified Oace et al application and claimed in any of the claims against which this patent is applied, namely, claims 6, 7, 8, 13 and 14. I can see no reasonable basis on

which the disclosures of Schmidt or Groff could be combined with the disclosures of Eustis et al or Mitchell so as to anticipate what is taught in the Oace et al specification and claimed in the claims thereof. In my view, the pressure-sensitive vinyl plastic electrical tape described and claimed by Oace et al was a pioneer contribution to the adhesive tape art, and is not taught or suggested by the antecedent art.

Affidavit of T. W. Sharp, of April 17, 1953, manager of the Sheet and Foil Division, Industrial Products Department, of the Bakelite Company, a Division of Union Carbide and Carbon Corporation.

79-80 T. W. SHARP, being duly sworn according to law, deposes and says that he is, and since January 1, 1945 has been, employed by the Bakelite Company, a Division of Union Carbide and Carbon Corporation. Prior to his employment by Union Carbide and Carbon Corporation, he graduated from Harvard University with the degree of Bachelor of Arts in Chemistry.

Bakelite Company has long been a manufacturer of various types of vinyl films, and they have been sold in sheet form and, to some extent, in tape form. Affiant is advised and believes that on or about December 6, 1945 Mr. H. J. Tierney, of Minnesota Mining and Manufacturing Company, called at the office of the Bakelite Company and had a discussion with Mr. H. K. Intemann, and others, relative to whether the Bakelite Company would manufacture for said Minnesota Mining and Manufacturing Company a special type of vinyl plastic film backing to be used in the commercial production of pressure-sensitive vinyl plastic electrical tape, and the Bakelite Company agreed

to make limited quantities of such film for Minnesota Mining and Manufacturing Company and to its specifications. Prior to that time, to the best of Affiant's knowledge and belief, no one other than Minnesota Mining and Manufacturing Company had ever placed on the market, or made, a pressure-sensitive vinyl plastic electrical tape. The usual type of electrical insulation then employed for splices was rubber electricians' tape, over which was wound friction tape.

On or about March 18, 1946, Dr. W. E. Lundquist, of Minnesota Mining and Manufacturing Company, wrote to the Bakelite Company, a Division of Union Carbide and Carbon Corporation, to the attention of Mr. T. R. Orme, and therein disclosed the specific formulation of the vinyl film desired by Minnesota Mining and Manufacturing Company for the manufacture of the pressure-sensitive vinyl plastic electrical tape and ordered a quantity of said film for commercial production of said tape. On or about June 7, 1946, in response to a follow-up letter from Dr. Lundquist, inquiring as to why the special vinyl film ordered had not been shipped, Mr. T. R. Orme wrote to Dr. Lundquist, stating that "the formulation was supplied by you", i.e., by Dr. Lundquist of Minnesota Mining and Manufacturing Company, and further stating that previous to receiving this formulation, the Bakelite Company "had had no experience in running a compound of this type in production". Accordingly, the film made by the Bakelite Company in the year 1946, in accordance with the directions of Minnesota Mining and Manufacturing Company, was of a type different from any film on which the Bakelite Company had had previous experience in production; and the pressure-sensitive vinyl plastic electrical tape made by Minnesota Mining and Manufacturing Company there-

from was, to the best of Affiant's knowledge and belief, a new commercial product. The first shipment of such film by the Bakelite Company to Minnesota Mining and Manufacturing Company was made, in small quantity, in or about September, 1946. On or about November 5, 1946, Minnesota Mining and Manufacturing Company ordered 2,000 pounds of such film, and subsequently ordered larger quantities, which orders were filled by the Bakelite Company. Film of that type was supplied by the Bakelite Company to Minnesota Mining and Manufacturing Company for the purpose of making pressure-sensitive vinyl plastic electrical tape.

Further Affiant saith not.

/s/ T. W. SHARP
T. W. SHARP

Affidavit of May 5, 1953, of Robert H. Breither, an engineer, of Lion Manufacturing Corporation, Chicago Ill.

85 ROBERT BREITHER, being duly sworn according to law, deposes and says:

That he is an engineer employed by Lion Manufacturing Corporation, 2640 Belmont Avenue, Chicago, Illinois, and has been employed by said corporation and its parent company for about twenty-two years. During World War II, the Lion Manufacturing Corporation, among other things, manufactured component parts and control units used in chin turrets, and these units contained harness assemblies which Lion Manufacturing Corporation wrappep with an ordinary vinyl film and sealed with cyclohexanone, a solvent for the vinyl film. This procedure was extremely messy in production and caused considerable

trouble. It left up to the assembler the decision as to how much cyclohexanone to apply. In some cases too much of it was applied, causing the vinyl film to tear and dissolve. Nonetheless, it was the best system for insulating joints on such units then available. Thereafter this method of insulting harness assemblies was replaced by the use of "SCOTCH" Brand Electrical Tape, a pressure-sensitive vinyl plastic electrical tape. Samples of such a product were first brought to the attention of Lion Manufacturing Corporation by representatives of Minnesota Mining & Manufacturing Company in the year 1945 and, due to its uniqueness and great advantages, was immediately adopted by Lion Manufacturing Corporation, and has been used by Lion Manufacturing Corporation in increasing quantities in subsequent years. In affiant's opinion, pressure-sensitive vinyl plastic electrical tape was a highly important contribution to the electrical industry.

/s/ ROBERT H. BREITHER
ROBERT BREITHER

Excerpts from Applicants' Brief on Appeal, dated October 22, 1953

THE REJECTION

143 The rejection, as stated in the final action (Paper No. 4), was that:

(1) The reissue should be denied on the ground of estoppel, because some claims (narrower in some particulars than certain of the claims of this reissue application) were cancelled during the prosecution of the original application.

* * * * * * * * * * *

145 The unsoundness of the estoppel rejection was pointed out fully in Amendment dated June 15, 1953,

at pages 10 to 14 thereof. If the Examiner did not intend to drop it in Office action dated July 20, 1953, it should be dropped, as clearly inapplicable to the facts of this case.

• • • • • • • • • •

169 The examiner referred to the cancellation of original claims 1-3 in the original patent application as a basis for the estoppel rejection herein. It is a well-established principle that one cannot present, in a reissue application, the identical claim cancelled from an original application, and the Examiner argues that this principle should be extended so that one could not cover in a reissue application some or all of the territory covered by a cancelled claim of the original application, . . .

• • • • • • • • • •

. . . Claim 3 was cancelled primarily because of arguments about the specificity of the definition of certain elements of the claim, and not because of any anticipatory prior art.

Excerpts from Reply Brief of Applicants
Filed October 22, 1953

197-198 Claim 3 of Serial No. 641,000 is directed to an adhesive tape article, and it was replaced by the claims of the original patent, which are claims 1 to 5 of this reissue application. It will be noted that there are very significant differences in terms between that cancelled claim 3 and claim 16 of the present application, for example, which stands allowed, subject to applicants' right to a reissue. Claim 16 is in some respects broader and in other respects narrower in defining the "plasticizing material" for the vinyl polymer. Claim 16 is definitely more

specific than said cancelled claim 3 in reciting that the film backing has a thickness of 4 to 20 mils. There is an obvious difference in scope between the definition of the adhesive layer or coating in claim 16 and in the cancelled claim 3. There are other obvious differences between claim 16 and said cancelled claim 3. To paraphrase the wording of the Court of Appeals for the Ninth Circuit in *National Nut Co. v. Sontag Chain Stores,* 107 F. (2d) 318, "claims of the scope of claim 16 and the other claims here on appeal were never in, and cancelled from, the original application" (see original brief, page 41).

To paraphrase the Court of Appeals, Fourth Circuit, in *Florence-Mayo Nuway Co. v. Hardy,* 168 F. 2d 778, 783 (end of col. 2): "Claim 16 (and others) of this reissue application points out, as cancelled claim 3 did not do, what is the heart of the invention claimed."

• • • • • • • • • • •

202 Applicants are not here asserting any claim which is the same or substantially the same as any claim cancelled from their original application. . . . Accordingly, the rejection on estoppel is not supported. . . .

Excerpts from Decision of the Board of Appeals, dated January 25, 1954

209 . . . Since claims 1, 2, 4, 5 and 16 are of substantially the same scope as were claims 1 to 5, inclusive, allowed in the original patent, we do not see how any estoppel can arise against such claims . . .

• • • • • • • • • • •

215 The decision of the Examiner . . . is reversed with respect to claims 1, 2, 4, 5 and 16.

Excerpts from Applicants' Request for Reconsideration by the Board of Appeals, filed February 23, 1954

217-218 At page 6 of the decision it is stated that claim 17" does not, in our opinion, materially differ from claim 3 of the earlier application". Claim 17 is copied in the Board's decision (pages 2 and 3). Likewise, claim 3 of the earlier application, as well as the rejection thereof, is copied into the Board's decision (at page 5 thereof).

One significant difference is in the description or definition of the film-forming vinyl polymer.

Claim 17 calls for "a film-forming polymer of monomer material including at least a *major* proportion of vinyl chloride". Claim 3 of the original application, on the other hand, did not contain such provision; and in respect thereto, in the rejection of said claim, the Examiner ruled:

> "The term 'vinyl chloride polymer' is too broad since it includes all polymerized resins which may include *some vinyl* chloride."

(See page 5 of the Board's decision herein of January 25, 1954.)

Thus claim 17 differs from said claim 3 of the original application in an important respect, so as to avoid a ground of rejection leveled against said claim 3.

It will be seen that claim 17 is like allowed claim 16 in this and most other respects; and not like said cancelled claim 3.

As another illustration of a significant difference, claim 3 of the original application failed to limit the proportion

of the plasticizer to the polymer, whereas appeal claim 17 does recite such proportion. Claim 17 has both a lower and upper limit on the proportion of plasticizer to film-forming vinyl polymer, in this respect also being similar to allowed claim 16. It provides that the plasticizer for the vinyl polymer is present "in an amount within the range of at least about 1/3 the weight of said polymer but in a substantially lesser amount than said polymer". On the other hand, claim 3 recites no lower percentage limit on the proportion of plasticizer; and, further, does not really recite an upper percentage limit of the entire plasticizer.

Claim 17 also contains other differences over cancelled claim 3 of the original application, e.g., that the backing is much thicker than ordinary cellophane tape backings, a "thickness of about 4 to 20 mils" being specified. Again, claim 17 is like allowed claims 1 and 16 in this respect and different from said cancelled claim 3.

The primary difference between claim 17 and allowed claim 16 is that claim 17 does not recite a primer coating. A primer coating is desirable but not essential. This has been recognized throughout, as shown by claim 1 of the original patent, which, likewise, does not recite a primer. The difference of claim 17 over allowed claim 16 parallels the difference of allowed claim 1 over allowed claim 4. One recites a primer coating; the other does not.

Significant differences between appeal claim 17 and cancelled claim 3 of the original application therefore exist, as just pointed out above. So this is not a case where applicants are attempting to recapture "claims in substantially their original form". But even this has been recognized as proper where "the applicant was induced by the Patent Office to narrow his claims" unnecessarily, whereupon "the

Patent Office . . . (thus) contributed to the mistake": see the decision of Judge Pine in *Kinnear v. Marzall*, 95 F. Supp. 55, at 58 (January, 1951), which cites and relies upon *Morey* v. *Lockwood*, 8 Wall. 230, 75 U. S. 230, 19 L. Ed. 339. However, appellants do not need to invoke these principles, as claim 17 differs materially in terms and scope from cancelled claim 3 of the original application.

• • • • • • • • • • • •

219 To such extent as cancelled claim 3 resembles appeal claim 17, it still more closely resembles claims 1 to 5 (which were claims of the original patent). Hence such subject matter was never given up; and, accordingly, there can be no estoppel in respect thereto.

Excerpts from Decision of the Board of Appeals on Reconsideration, dated March 18, 1954

222-223 Claim 17 was refused for two distinct reasons, first, as without patentable merit over the Schmidt patent and, second, by reason of estoppel arising from the rejection of claim 3 in the earlier application and its subsequent withdrawal. With respect to the rejection on estoppel, petitioners now direct attention to particular differences between claim 3 of the former case and claim 17.

• • • • • • • • • • • •

224 We have reviewed our decision in connection with the contentions presented in the petition and have come to the conclusion that the rejection of claim 17 should not be sustained.

• • • • • • • • • • • •

Our decision is altered to the extent that the rejection of claim 17 is reversed, . . .

• • • • • • • • • • • •

Excerpts from Applicants' Supplemental Oath, dated June 22, 1954

243-244 Deponents failed adequately to explain to their attorneys, during the prosecution of their original application, the nature and characteristics of the materials described in the specification, and the relationship of the characteristics of such materials to each other, from which the actual scope of the invention may be determined, and the importance of the details thereof. Each and all of the deponents were virtually without any prior experience in connection with patents at the time of their original application. As a result of conferences and discussions had within one month prior to the filing of their above identified reissue application, Serial No. 298,013, on July 9, 1952, it became apparent to the deponents that their invention was not sufficiently or adequately claimed, within the scope of the disclosures of their specification and of the inherent qualities of the illustrative embodiments of their invention as disclosed therein, and that the claims of their original patent, except by the application of the doctrine of equivalents, were not sufficient adequately to cover their invention. In particular, it became apparent that deponents themselves, upon a reading of the specification, could readily suggest how to evade the terms of each of the claims of their original patent, while making the product defined in their said original patent.

• • • • • • • • • •

Excerpts from Plaintiff's Exhibit 5—Consolidated Requests for Admissions, directed to defendants, Sears Roebuck and Plymouth Rubber, and their Responses. (All requests not specifically denied are admitted, per statement of defendants' counsel, as well as per Rule 36 of Rules of Civil Procedure.) Requests 1 to 60 inclusive and 69, and Responses.

1. As far back as about 1928 Plymouth Rubber Company, Inc., was making and selling friction tape. (605)*
(No answer)

2. Friction tape consists of strips of cotton sheeting impregnated with an adhesive insulating compound based on rubber or bitumen. (P. 5, Px-117, "Kabelitems")*
(No answer)

3. As far back as about 1928 Plymouth Rubber Company, Inc. was making and selling a rubber insulation tape. (605 and 606)
(No answer)

4. Rubber insulating tape is rubber compounds calendered to a normal thickness of about 0.030 inch. (5, PX-17)
(No answer)

5. At least as early as 1928, Plymouth Rubber Company, Inc. was making and selling cable tape. (654)
(No answer)

6. Cable tapes are dry and non-tacky. (85, 688)
(No answer)

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* References are to pages of depositions taken here in Boston, February 1955, or to exhibit numbers.

7. Cable tape is used by cable manufacturers to wind spirally around electrical cables. (85)
(No answer)

8. At least as early as 1947 or 1948, and before Plymouth commenced its pressure-sensitive vinyl plastic tape project, Plymouth Rubber Company, Inc. began producing and selling a non-adhesive plastic harness tape, made from a vinyl sheeting, plasticized to make it stretchable. (692)
(No answer)

9. The Plymouth Rubber Company, Inc. had made and sold vinyl chloride plastic raincoats, vinyl chloride plastic baby pants, and other sheeted vinyl plastic material for roughly ten years prior to February, 1955. (9)
(No answer)

10. Plymouth Plastic Electrical Tape was developed for Plymouth Rubber Company, Inc. by Morris M. Danovitch, chief chemist of the tape and cable division of said company. (14 and 16)
(No answer)

11. Said Danovitch first worked with vinyl resins around 1942 or 1943. (14 and 16)
(No answer)

12. From his previous experience, in the year 1948 said Danovitch was already familiar with plasticizers and vinyl resins. (9 and 14)
(No answer)

13. Said Danovitch first became familiar with the fact that "SCOTCH" Brand Electrical Tape, No. 33, was on the market "sometime around the latter part of '47". (20)
(No answer)

14. When said Danovitch started his work to make Plymouth Plastic Electrical Tape, "We had some 'SCOTCH' tape to guide us. Just to look at. You could buy it in any store." (24)

Answer: As to item 14, defendant denies the quotation. The witness Danovitch said: "We had some 'Scotch' tape but not to guide us. Just to look at. You could buy it in any store."

15. Said Danovitch read "ads in the papers" in or about the year 1948 on "SCOTCH" Brand No. 33 Electrical Tape. (78)

(No answer)

16. Before said Danovitch started his work to make Plymouth Plastic Electrical Tape in 1948 he had examined a pamphlet entitled "Kabelitems", No. 25, date April, 1948, published and distributed by Bakelite Corporation, a unit of Union Carbide and Carbon Corporation. (Said pamphlet was marked for identification as Plaintiff's Exhibit 17 in the depositions taken herein in Boston in February, 1955.) (256)

(No answer)

17. The pamphlet referred to in the foregoing request discloses the physical and electrical properties of the pressure-sensitive, stretchable and retractable vinyl plastic insulating tape sold commercially as "SCOTCH" Brand Electrical Tape, and the application and use thereof.

Answer: As to item 17, defendant admits only if in line 2 the words "some of" are inserted before "the physical and electrical properties."

18. Said Danovitch knew in 1948 that "SCOTCH" Brand

No. 33 Electrical Tape was made with a polyvinyl chloride backing. (254 and 255)
(No answer)

19. Said Danovitch knew in 1948 that the polyvinyl backing of "SCOTCH" Brand No. 33 Electrical Tape contained plasticizer material. (255)
(No answer)

20. Said Danovitch compared Plymouth Plastic Electrical Tape he was developing with the "SCOTCH" Brand No. 33 Electrical Tape of commerce as to tensile strength and elongation. (74)
(No answer)

21. Said Danovitch was told by Frank Harris, Vice President of said Plymouth Rubber Company, to produce "an adhesive plastic tape." (629)
(No answer)

22. Said Harris said to said Danovitch in 1948, "Make me a roll of plastic tape." (631)
(No answer)

23. Frank Harris, Vice President of Plymouth Rubber Company, Inc., first knew of pressure-sensitive, stretchable vinyl plastic electrical tape around 1947. (617)
(No answer)

24. Said Frank Harris knew by April, 1948, that Minnesota Mining & Manufacturing Company was making pressure-sensitive, stretchable and retractable vinyl plastic insulating tape. (617, 619-20)
(No answer)

25. Said Danovitch started his work to make Plymouth Plastic Electrical Tape in 1948. (12, 631, 667)
(No answer)

26. Said work was commenced at least as early as August or September, 1948. (50)
(No answer)

27. On or about May 16, 1950, sample rolls of Plymouth Plastic Electrical Tape were submitted to Underwriters Laboratories for a certificate of approval. (695, DX-30)
(No answer)

28. Plymouth Plastic Electrical Tape was approved by Underwriters Laboratories on or about October 20, 1950. (20)
(No answer)

29. Plymouth Plastic Electrical Tape was first sold late in the year 1950. (25)
(No answer)

30. By February, 1955, the sale of Plymouth Plastic Electrical Tape was several times higher in proportion to the sales of rubber and friction tape than it was in 1951. (143)
Answer: As to item 30, defendant denies that this request accurately states the substance of the testimony referred to. Defendant admits that by February, 1955, the percentage of sales of Plymouth Plastic Electrical Tape in relation to its sales of rubber and friction tape was several times more in percentage than it was in 1951.

31. In his experiental work said Danovitch made samples using as the plasticizing material for the vinyl polymer:

(a) PARAPLEX G-25 (88, 89)
(No answer)

(b) PARAPLEX G-40 (88, 89)
(No answer)

(c) Dioctyl phthalate (sometimes referred to as DOP) (33)

Answer: As to item 31 (c), defendant denies use by Danovitch of Dioctyl phthalate (DOP) except "a small amount" in laboratory experiment and in one experimental factory run five parts of DOP mixed with 74 parts of G-40.

(d) Mixtures of PARAPLEX G-25 and DOP (32 and 88)

Answer: As to item 31(d) defendant denies use by Danovitch in experimental work of mixtures of G-25 and DOP except mixtures of G-25 and "a very small minute part" of DOP in laboratory experiment.

(e) Tricresyl phosphate (33)

Answer: As to item 31(e) defendant denies use by Danovitch in experimental work of Tricresyl phosphate except "in one case a small amount of Tricresyl phosphate" in laboratory experiment.

(f) PARAPLEX G-60 (33)

Answer: As to item 31(f), defendant denies use by Danovitch of G-60, except "a small amount of G-60" in laboratory experiment.

(g) "Quite a few" combinations of polyester and liquid components. (34)

Answer: As to item 31(g) defendant admits that Danovitch used "quite a few" combinations of polyester and liquid components in laboratory experiment.

(Each lettered item requires a separate response.)

32. In his experimental work to make Plymouth Plastic Electrical Tape for Plymouth in 1948-49, Danovitch "didn't have a very good success with G-25 at that time." (743)
(No answer)

33. In the development of Plymouth Plastic Electrical

Tape, 53 or 54 "factory formulations, including factory experimental runs" were made. (371)
(No answer)

34. A much greater number (than 53 or 54) of laboratory formulations were tried by Danovitch in the development of Plymouth Plastic Electrical Tape. (371)
Answer: As to item 34, defendant denies that Danovich tried a much greater number (than 53 or 54) of laboratory formulations but admits that in addition to the 53 or 54 factory formulations and factory experimental runs there were many laboratory experimental formulations, making the total number of factory and laboratory formulations greater than the figure 53 or 54 because some were mixed in the laboratory only.

35. After production and sale of Plymouth Plastic Electrical Tape began, there was trouble with pinholes, telescoping of rolls, appearance, waste and seconds. (678)
(No answer)

36. These troubles were corrected somtime in 1952. (678)
(No answer)

37. Except that some equipment in the factory of Plymouth Rubber Company, Inc., "We had to modify for the plastic tape, as by change of knife settings and adjustments", the said Plymouth Company used the same mixing, milling, calendering and coating equipment for Plymouth Plastic Electrical Tape that it had used and continued to use in producing such vinyl sheet products as baby pants, raincoats and shower curtain material. (85-87)
(No answer)

38. The same equipment was and is used in mixing the ingredients for Plymouth Plastic Electrical Tape as had

previously been used for mixing the ingredients for baby pants or shower curtain material. (87)

(No answer)

39. The same equipment on which vinyl plastic sheeting was calendered for shower curtains and baby pants was and is used to calender the vinyl plastic sheeting for the backing member of Plymouth Plastic Electrical Tape. (87)

(No answer)

40. The same equipment was and is used for coating the adhesive on the backing member of Plymouth Plastic Electrical Tape that was used earlier to coat adhesive on cloth, with some adjustments. (87-88)

(No answer)

41. PARAPLEX G-25 was first announced by Rohm & Haas or its predecessor, Resinous Products Company, in 1943.

Answer: As to item 41, defendant admits that Paraplex G-25 was first announced by Rohm & Haas or its predecessor, Resinous Products Company, in November, 1943.

42. In his experimental work to make Plymouth Plastic Electrical Tape, said Danovitch knew that Rohm & Haas represented that its PARAPLEX G-40 and PARAPLEX G-25 each is a plasticizer which is resistant to migration. (311 and 312)

Answer: As to item 42, defendant admits that Danovitch knew that Rohm & Haas represented that its Paraplex G-40 and Paraplex G-25 each is a "non-migrating" plasticizer.

43. PARAPLEX G-40 is of lower average molecular weight than PARAPLEX G-25.

(No answer)

44. In his experimental work said Danovitch "got the same results using the straight (PARAPLEX) G-40" as he did using PARAPLEX G-25 and dioctyl phthalate. (89)
Answer: As to item 44, defendant denies. Defendant admits that in his experimental work said Danovitch "got the same results using straight (Paraplex) G-40" as he did using Paraplex G-25 and Dioctyl phthalate from the standpoint of good dispersal only.

45. It would require approximately 3 to 4 parts of PARAPLEX G-25 to one part of dioctyl phthalate to get a plasticizer material having an average molecular weight equal of that of PARAPLEX G-40. (308)

Answer: Defendant denies the truth of the matter set forth in item 45.

46. In his development work of Plymouth Plastic Electrical Tape, said Danovitch was interested in results and not in molecular weights or mixtures. (309 and 310).
Answer: (No answer)

47. Prior to the advent of pressure-sensitive, vinyl plastic electrical tape, the accepted standard of a good insulation splice was the use of rubber electrician's tape overwound with friction tape. (22-23)
Answer: (No answer)

48. Plymouth Rubber Company, Inc., has "used as a sales argument that plastic electrical tape if properly used is cheaper for the electrician than the combination of friction and rubber tape". (193)
Answer: (No answer)

49. The Plymouth Rubber Company, Inc., is responsible for the publication and distrtibution of the advertising

material identified in the record as Plaintiff's Exhibit 11. (276, 280)

Answer: (No answer)

50. The advertisement of Plymouth Rubber Company, Inc., appearing in "Contractor's Electrical Equipment", in issues thereof of February, April, June, August, October and December of 1951, representing that Plymouth Plastic Electrical Tape is

"Protective	Economical
Durable	Practical
Versatile	Convenient
Safe	Tough"

is substantially true. (PX-11)

Answer: (No answer)

51. The representations in an advertisement proofed December, 1952, by the printer to Plymouth Rubber Company, Inc., that Plymouth Plastic Electrical Tape is:

"RECOMMENDED IN PLACE OF FRICTION AND RUBBER TAPES IN THE FOLLOWING SITUATIONS:

1. Where tape is subject to abrasion (resists abrasion).
2. Where space is limited (makes neater job, as in terminal box).
3. Where tape is subject to water, acids, alkalies, corrosion (resists all).
4. Where time must be saved (does the job much more quickly)."

are substantially true. (PX-11)

Answer: (No answer)

52. Plymouth Rubber Company, Inc., is responsible for the publication and distribution of the envelope stuffer marked Plaintiff's Exhibit 7 for identification. (299, 189)

Answer: (No answer)

53. The physical, electrical and chemical properties stated in Plaintiff's Exhibit 7, for identification, for Plymouth Plastic Electrical Tape No. 7 and No. 10 are substantially correct.

Answer: (No answer)

54. Plymouth Rubber Company, Inc., has represented to the public that its Plymouth Plastic Electrical Tape is:

"Sunlight	Not affected
Corrosive effect on electrical conductors	None
Resistance to water	Excellent
Resistance to acids	Excellent
Resistance to alkalies	Excellent
Resistance to oils	Excellent
Resistance to aging at room temperatures	Excellent"

(PX-6, 7)

Answer: (No answer)

55. In the production of Plymouth Plastic Electrical Tape sold by Plymouth Rubber Company, Inc., other than to the United States or an agency thereof, the plasticizer for the vinyl plastic backing material from first production in 1950 to August 3, 1954, was principally PARAPLEX G-40.

Answer: As to item 55, defendant denies the accuracy of the statement of this request. Defendant admits that in th production of Plymouth Electrical Tape sold by Plymouh Rubber Company, Inc., other than to the United States or an agency thereof, and except for some tape sold

to Sears, Roebuck & Company, Paraplex G-40 was the sole plasticizer for the vinyl plastic backing material from the first production in 1950 to August 3, 1954.

56. In May of 1954, to meet government specifications, in plastic tape made for the United States, Plymouth Rubber Company, Inc., used PARAPLEX G-25 as the principal ingredient of the plasticizing material for the backing member of this Plymouth Plastic Electrical Tape. (378-9)

Answer: As to item 56, defendant admits only if the statement is amended by substituting for the word "principal" in line 3, the word "sole".

57. In a deposition taken herein on February 16, 1955, Frank Harris, a vice president of Plymouth Rubber Company, Inc., was asked the following questions and gave the following answers:

"Q451 You, of course, are now familiar with the Minnesota Mining & Manufacturing tape known as the 'Scotch' electrical tape No. 33?

A. I don't know anything about that number, no.

Q452 Well, does it represent a tape that you visualized that you would get out of this work of Mr. Danovitch?

A. Oh, yes." (662)

Answer: (No answer)

58. "SCOTCH" Brand Electrical Tape, No. 33 and 22, and Plymouth Plastic Electrical Tape, of generally similar gauges, respectively, have substantially the same

(1) physical properties,

(2) chemical properties,

(3) electrical properties. (201-2)

Answer: (No answer)

59. The backing material of Plymouth Plastic Electrical Tape is a copolymer of vinyl chloride and vinyl acetate, containing plasticizing material. (291)

Answer: (No answer)

60. Plymouth Plastic Electrical Tape is (or includes)

(a) Pressure-sensitive (297)

(b) Stretchable (297)

(c) Retractable (297)

(d) Insulating (297)

(e) Water-resistant (298)

(f) Hydrocarbon oil insoluble (299)

(g) High dielectric strength (300)

(h) Film backing 4-20 mils thick (301)

(i) Backing a copolymer of vinyl chloride and vinyl acetate with vinyl chloride the predominating constituant (302)

(j) Backing a homogeneous mixture of plasticizing material and vinyl copolymers (302)

(k) Nonvolatile plasticizing material (302)

(l) Plasticizing material present within the range of at least about one-third of the weight of vinyl copolymer (30)

(m) Plasticizer material never present in as great a quantity as the vinyl copoolymer (303)

(n) Plasticizing material normally not present in greater quantity than one-half of the weight of the vinyl copolymer (303)

(o) Plasticizing material for the backing comprises PARAPLEX G-40 (304)

Answer: As to item 60 (o), defendant can neither admit nor deny because it does not know the sense in which the word "comprises" is used—whether in the sense of "consists" or of "includes". Defendant admits that as to one Plymouth product the plasticizing material for the backing consists of Paralplex G-40 only and as to its other product of Paraplex G-25 only.

(p) Backing material stretchy, elastic and retractable (315)

(q) Tape can be wound up in a roll upon itself and later unwound without delamination of the tape or offsetting of the adhesives (315)

(r) An adhesive primer coating (315)

(s) An adhesive primer coating adapted to increase the anchorage of the pressume-sensitive adhesive coating to the plasticized vinyl backing (315)

(t) Pressure-sensitive adhesive coating applied over primer coating (315)

(u) Adhesive coating water-insoluable (316)

(v) Adhesive coating normally tacky (316)

(w) Adhesive coating of a rubber-resin type (316)

(x) Adhesive coating relatively thin compared with the thickness of the film backing (316))

(y) Backing in equilibrium to adhesive coating (317-323)

Answer: As to item 60(y), defendant cannot admit or deny because it is not known in what sense the word "equilibrium" is used. Defendant admits that the Plymouth Plastic Electric Tape comprises a plasticized vinyl film and an adhesive coating wherein the coating does not become pasty or lose its tack when the tape is stored at ordinary room temperature for some weeks or months.

(z) No substantial migration of plasticizer from backing into adhesive (322)

(aa) No delamination of the tape (323)

(bb) No offsetting of the adhesive (323)

(cc) Stretchable in widths of an inch or less by hand pulling to at least 50% at room temperature (323)

(dd) Will stretch 100% (324)

(ee) If stretched 30% of its original length will retract "approximately" to its original length (324)

(ff) Readily conformable to irregular surfaces in insulating and splicing (324)

(gg) Will make a snug, tight splice (325)

(hh) Sufficiently aggressive adhesive to stay tightly and snugly wrapped about a splice (327)

Each lettered item is to be responded to separately.

Answer: (No answer except to items (o) and (y) as noted.)

* * * * * * * * * *

69. Sears, Roebuck & Company sells, and since prior to August 3, 1954, has sold, pressure-sensitive, stretchable and retractable, vinyl plastic electrical tape manufactured and packaged for it by Plymouth Rubber Company, Inc., under the brand name "HOMART".

Answer: (No answer)

Excerpts from Plaintiff's Exhibit B-17, Danovitch Deposition

"Kabelitems"

Bakelite Company—1948

Time-honored materials in the electrician's kit are friction tape and rubber insulating tape. . . . As a legacy from the days when rubber was the universal dielectric for building wire, rubber insulating and friction tapes continue on as splice insulating materials for vinyl plastic coated wire. This interim practice may well be discontinued when the merits of VINYLITE plastic backed electrical tapes are generally recognized.

EXCERPTS FROM DEFENDANTS' EXHIBITS

Patented May 29, 1951 2,554,791

Defendants' Exhibit 67 — Nickerson Patent

No. 2,554,791

UNITED STATES PATENT OFFICE

2,554,791

PRESSURE ADHESIVE TAPE AND SHEET

Mortimer H. Nickerson, Springfield, Mass., assignor, by mesne assignments, to Donald B. Alexander, Henry T. Chamberlain, John F. Mannion, Walter A. Wade, Edgar R. Bourke, Ernest W. Schneider, and Charles S. Vrtis, as trustees of The Arthur J. Schmitt Foundation, Lemont, Ill., a charitable trust

No Drawing. Application November 20, 1948, Serial No. 61,299

9 Claims. (Cl. 117—122)

1

This invention relates to an improved adhesive sheet, more particularly to sheets in tape form which may be prepared and sold in the form of rolls, one face of the tape being provided with a coating of pressure sensitive adhesive.

Tapes of this kind are commonly made of sheets, or strips of fabric, paper or regenerated cellulose, coated with a tacky composition of latex or reclaimed rubber with a gum or resin.

One of the difficulties encountered in the manufacture of such tapes is the tendency of the adhesive coating to peel or "offset" from the tape backing material when the tape is wound in roll form. This tendency results from various causes arising from the character of the backing strip, the adhesive used, and the nature of the plasticizers and solvents used in preparing the various elements of the tape and adhesive, and the relative adhesive and cohesive characteristics of the adhesive material.

One object of the present invention is to provide a pressure adhesive tape having improved toughness and electrical insulating characteristics, and possessing adhesive and non-offsetting properties adequate for the difficult conditions under which such a tape is used.

Other and further objects will be apparent from the following specification and claims.

coating of pressure sensitive adhesive.

Tapes of this kind are commonly made of sheets, or strips of fabric, paper or regenerated cellulose, coated with a tacky composition of latex or reclaimed rubber with a gum or resin.

One of the difficulties encountered in the manufacture of such tapes is the tendency of the adhesive coating to peel or "offset" from the tape backing material when the tape is wound in roll form. This tendency results from various causes arising from the character of the backing strip, the adhesive used, and the nature of the plasticizers and solvents used in preparing the various elements of the tape and adhesive, and the relative adhesive and cohesive characteristics of the adhesive material.

One object of the present invention is to provide a pressure adhesive tape having improved toughness and electrical insulating characteristics, and possessing adhesive and non-offsetting properties adequate for the difficult conditions under which such a tape is used.

Other and further objects will be apparent from the following specification and claims.

I have found that a plasticized polyvinyl chloride sheeting possesses the strength and elastic qualities needed for my purposes as a backing material particularly and preferably when properly stretch oriented. A satisfactory degree and character of orientation is provided by heating and stretching the sheet or film and holding it until cool. The degree of elongation imparted to the sheet may be 100% or higher.

The adhesive material may be a conventional water dispersion of reclaimed rubber, 30% solids, with or without some natural rubber, which is available under various trade names.

The use of a plasticized polyvinyl chloride backing involves certain problems such as the tendency to migration of the plasticizers present in the backing or used in connection with the adhesive materials. These and other problems arising from the use of the polyvinyl chloride backing are overcome by the specific materials and formulating steps shortly to be pointed out.

Polyvinyl chloride is most commonly plasticized with ester type plasticizers. By their chemical nature good plasticizers have good solvent action and compatibility with a wide variety of resinous materials. Since these plasticizers are generally liquids, they also possess mobility even when dissolved in or compounded with a suitable resin. This mobility accounts for the observed tendency of plasticizer to migrate from one solid phase to another where both phases are compatible with the plasticizer and are in close contact. In this case it was observed that the common liquid ester type plasticizers were compatible not only with the polyvinyl chloride backing sheet but also with the rubber composition used as the pressure-sensitive adhesive layer. Migration of the plasticizer into the adhesive layer caused an observable softening and loss of cohesiveness with a consequent weakening of the adhesive bond. The same would be true with copolymers of vinyl chloride and vinyl acetate, polyvinyl butyral, or cellulose acetate and similar materials.

A very necessary function of the adhesive layer in any so-called strippable tape is that while it must stick firmly and well to any surface on which it is pressed it must stick even more firmly to its own backing layer, in this case plasticized polyvinyl chloride. It was found that if an aqueous dispersion of reclaimed rubber were applied directly to a polyvinyl chloride sheet and dried thereon that the adhesion to the plasticized polyvinyl chloride was no greater than the adhesion to other surfaces on which the tape might be pressed. As a result, stripping of the tape resulted in offset, i. e., transfer of some of the adhesive layer from the plasticized polyvinyl chloride backing to the surface on which the tape had been pressed.

I have found that the two effects described in the above paragraphs can be eliminated by first prime-coating the polyvinyl chloride with polybutene B–100. This material, polybutene B–100, is a polymer of isobutylene having an average molecular weight of about 100,000. The average molecular weight for my purposes may vary between 60,000 (B–60) and 120,000 (B–120) but the B–100 is preferable and commercially available. It is most conveniently applied as a 10% solution in toluene or equivalent hydrocarbon solvent and may be applied by spraying or in any other suitable manner. This primer coating provides a surface to which the reclaimed rubber has a natural adhesion and also provides a barrier to the migration of the ester plasticizer into the adhesive layer. The primer coating may of course contain other materials than polyisobutylene and the latter will continue to exert its effect generally in proportion to the percentage in which it is present.

The polybutene primer coating is allowed to dry and a coating of the reclaimed rubber dispersion

is then applied. For best results two coats of the reclaimed rubber dispersion are applied, the first coat being allowed to dry before the second is applied.

After drying of the second adhesive coat the sheets, usually slit into tapes of various widths, may be rolled up on themselves to a convenient size for handling. The result of the above combinations of materials and processes is a strong flexible tape ready for instant use on unwinding from its roll and adhering strongly to dry surfaces.

Polyvinyl chloride may be suitably plasticized by mechanically blending it with an equal weight of a copolymer of butadiene and acrylonitrile. The acrylonitrile content of the copolymer may vary between 18–35%. Polyvinyl chloride plasticized in this way has certain advantages because of the resinous character of the plasticizer which effectively reduces any tendency towards migration. This backing is prime coated as above described. After drying of the primer coat an adhesive coating is applied which comprises a 25% solution of equal parts by weight of polybutene B–100 polybutene B–12 and an ester of a hydrogenated rosin acid, the latter increasing the cohesiveness. Polybutene B–12 is a polymer of isobutylene having an average molecular weight of about 12,000. A satisfactory rosin acid ester is commercially available as "Staybelite Ester 10." The addition of the B–12 gives increased adhesive qualities over the B–100 alone and the normally expected decrease in cohesiveness is obviated by the addition of the rosin acid ester. These materials are dissolved in an aromatic solvent such as toluene with a boiling point of about 111° C., or a combination of aromatic and aliphatic solvents in which the polybutenes are soluble and which are commonly available under various trade names, "Rubberso:" being an example.

In the last described combination the primer coat serves to bond the pressure sensitive adhesive coat and the backing sheet. Since the plasticizers in both the backing sheet and the adhesive coating are in this case resinous there is no tendency toward migration.

This last described combination has the advantage that the butadiene-acrylonitrile copolymer is exceptionally oil resistant and this resistance is retained in the polyvinyl chloride. The result is a strong tough pressure sensitive tape with excellent electrical properties and a superior resistance to oils and chemicals.

What I claim is:

1. A pressure sensitive adhesive tape comprising a backing strip of plasticized polyvinyl chloride, said strip being coated on one side with a polymer of isobutylene having an average molecular weight of not substantially less than 60,000 and not substantially greater than 120,000, and having a coating of pressure sensitive adhesive superposed on said first-named coating, said adhesive comprising mainly a water dispersion of reclaimed rubber, 30% solids, the first-named coating providing a non-offsetting bond between the backing strip and the adhesive coating and preventing the migration of migratory plasticizers from the backing into the adhesive.

2. A pressure sensitive adhesive tape comprising a backing strip of plasticized stretch oriented polyvinyl chloride, said strip being coated on one side with a polymer of isobutylene having an average molecular weight of not substantially less than 60,000 and not substantially greater than 120,000, and having a coating of pressure sensitive adhesive superposed on said first-named coating, said adhesive comprising mainly a water dispersion of reclaimed rubber, 30% solids, the first-named coating providing a non-offsetting bond between the backing strip and the adhesive coating and preventing the migration of migratory plasticizers from the backing into the adhesive.

3. A pressure sensitive adhesive tape comprising a backing strip of plasticized, polyvinyl chloride, said strip being coated on one side with a solution of a polymer of isobutylene having an average molecular weight of approximately 100,000 in an aromatic solvent, and having a coating of a rubber-type pressure sensitive adhesive superposed on said first-named coating, said adhesive comprising mainly a water dispersion of reclaimed rubber, 30% solids, the first-named coating providing a non-offsetting bond between the backing strip and the adhesive coating and preventing the migration of migratory plasticizers from the backing into the adhesive.

4. A pressure sensitive adhesive tape comprising a backing strip of stretch oriented, plasticized polyvinyl chloride, said strip being coated on one side with a solution of a polymer of isobutylene having an average molecular weight of approximately 100,000 in an aromatic solvent, and having a coating of a rubber-type pressure sensitive adhesive superposed on said first-named coating, said adhesive comprising mainly a water dispersion of reclaimed rubber, 30% solids, the first-named coating providing a non-offsetting bond between the backing strip and the adhesive coating and preventing the migration of migratory plasticizers from the backing into the adhesive.

5. A pressure sensitive adhesive tape comprising a backing strip of stretch oriented ester plasticized polyvinyl chloride, said strip being coated on one side with a solution of a polymer of isobutylene having an average molecular weight of approximately 100,000 in an aromatic solvent, and having a coating of a rubber-type pressure sensitive adhesive superposed on said first-named coating, said adhesive comprising mainly a water dispersion of reclaimed rubber, 30% solids, the first-named coating providing a non-offsetting bond between the backing strip and the adhesive coating and preventing the migration of migratory plasticizers from the backing into the adhesive.

6. A pressure sensitive adhesive tape comprising a backing strip of polyvinyl chloride plasticized with a copolymer of butadiene and acrylonitrile provided on one side with a coating consisting of a solution of a polymer of isobutylene having an average molecular weight of approximately 100,000 and having a coating of pressure sensitive adhesive superposed on said first-named coating, the latter providing a non-offsetting bond between the adhesive and the backing strip, said pressure sensitive adhesive comprising substantially equal parts of a polymer of isobutylene having an average molecular weight of approximately 100,000, a polymer of isobutylene having an average molecular weight of approximately 12,000 and an ester of hydrogenated rosin acid.

7. A pressure sensitive adhesive tape comprising a backing strip of stretch oriented polyvinyl

Excerpts from Plaintiff's Exhibit 19—Chart illustrating plaintiff's analysis of claims in issue, verbatim. Claims 1 & 6.

Claim 1.

A pressure-sensitive adhesive insulating tape wound upon itself in roll form and comprised of:

I. A stretchable and elastic film backing having
  (1) a thickness of 4 to 20 mils and
  (2) formed of a homogeneous mixture primarily consisting of a stable blend of
    (a) a film-forming polymer of monomers including at least a major proportion of vinyl chloride,
    (b' a substantially non-volatile liquid phthalyl
    (ester plasticizer amounting to 8 to 20 parts
    (per 100 parts of said polymer, and
    (b" a soft and viscous low-acid-number alkyd
    (plasticizer resin in amount at least equal to
    (the amount of said liquid phthalyl ester
    (plasticizer,
      (y) the total amount of said plasticizers being about 1/3 to ½ the amount of said polymer and
    (c) the proportions being such that the adhesive tape has the properties of stretch and elasticity hereafter specified without causing pastiness or tack-loss of the contacting adhesive in the roll; and

II. A cucohesive normally tacky and pressure-sensitive rubber-resin type adhesive coating united to the inner face of said film backing;

1. said adhesive tape unwindable without delamination or offsetting of adhesive,
2. being originally stretchable by hand-pulling to an extent of at least 50% at room temperature and
3. being substantially completely retractable from an elongation of 30% as herein specified.

Claim 6

pressure-sensitive adhesive insulating tape wound upon itself in roll form and comprising:

I. A water-insoluble and hydrocarbon-oil-insoluble film backing of high dielectric strength.
   (1) Containing a stabilizer and
   (2) having a thickness of 4 to 20 mils and
   (3) formed of a homogeneous mixture primarily consisting of a stable blend of
      (a) a film-forming polymer of monomers including at least a major proportion of vinyl chloride, and
      (b) a substantially non-volatile plasticizing material therefor in an amount within the range of at least 1/3 the weight of said polymer but in a substantially lesser amount than said polymer and comprising
         (x) at least a major proportion of a non-migrating viscous plasticizer resin, and
      (c) the proportions being such that the adhesive tape has the properties of stretch, elasticity and retractability hereafter specified without causing pastiness or loss of the tack of the contacting adhesive in the roll;

II. An adhesive primer coating on the inner face of the film backing adapted to increase the anchorage of adhesive coating; and

III. A water-insoluble normally tacky and pressure-sensitive rubber-resin type adhesive coating united to the inner face of said film backing, over said primer coating, said adhesive coating being thin in relation to said film backing;
   (1) said film backing being in permanent equilibrium with said pressure-sensitive adhesive coating so as to avoid pastiness or loss of tack of the said adhesive coating and diminution of the flexibility of said film backing;

said adhesive tape being unwindable from the roll without delamination of the tape or offsetting of the adhesive,

being originally stretchable in widths not greater than about one inch by simple hand pulling, exercising a force of not more than about 10 to 15 pounds, to an extent of at least 50% at room temperature and

being substantially completely retractable from an elongation of 30%, as herein specified;

said tape being readily conformable to irregular surfaces in insulating wire splices and

its elasticity, retractability and high adhesion value making it easy, in insulated splices, to produce snug wrappings and coverings, and

said tape having sufficiently aggressive adhesiveness to remain tightly and snugly wrapped around splices and wires.

Plaintiff's Exhibit T-15

(Handwritten)

Paraplex G-25 Resin 90129
Sample obtained from supply in tape Lab.
Manufactured by Resinous Products Company.

Resin hydrolyzed with alcoholic KOH & determinations run on solution.

The Resin was made from sebacic acid, a glycol—probably propylene glycol,—, and a small amount of an oil. A phosphorus catalyst was probably used. There was no sulfur, nitrogen, chlorine, or castor oil present.
Reported 9-19-44
AR-186

R. W. PERLICH

Witness:
W. E. LUNDQUIST
12-17-45

Plaintiff's Exhibit T-15A

ANALYTICAL TEST REPORT
TAPE DEPARTMENT

AR-186 Sept. 19, 1944

SUBJECT: Paraplex G-25 Resin

REPORT:

A sample of Paraplex G-25 Resin manufactured by the Resinous Products Company was obtained from a supply in the Tape Laboratory. This resin is being used as a non-bleeding plasticizer for Vinylite Resins.

The resin was made from sebacic acid and a glycol, probably propylene glycol. There was a small amount of phosphorus present, probably from the catalyst. There was also

a small amount of an unidentified oil present. There was no sulfur, nitrogen, chlorine, or castor oil present.

Paraplex G-25 was thought to be made under one of the following patents obtained by Mr. H. A. Bruson, assignor to the Resinous Products & Chemical Company: 1,783,166; 1,783,167; 1,783,168. These patents involve the use of a polyhydric alcohol having three or more hydroxy groups and a dibasic acid having from six to ten carbon atoms. The alcohols would include such compounds as glycerol and mannitol; the acids include adipic, pimelic, suberic, azelaic, and sebacic acids. The use of a trihydric alcohol would produce an ester having side chains. A representative of the Resinous Products Company made the statement that Paraplex G-25 had no side chains and this would indicate the use of a dihydric glycol. Chemical tests indicate that this glycol could be propylene glycol which would fit in with the above conditions.

In Patent No. 1,783,167, an oil was introduced into the resin formed with glycerol and sebacic acid to produce a more flexible resin. The oils used included castor oil, linseed oil and other drying oils. Dihydric glycols were also added to produce a tack in the final resin. The drying oils produced a non-tacky resin.

It is my opinion that Paraplex G-25 was not made under the above mentioned patents inasmuch as those patents were based on a poly hydric alcohol having three or more hydroxy groups. Paraplex G-25 is probably made from a dihydroxy alcohol. The oil present in this resin probably brings it under the scope of Patent No. 1,783,167.
Reference: Notebook 901, page 29.

/s/ R. W. PERLICH
R. W. PERLICH

RWP:mc

Plaintiff's Exhibit T-16

TAPE LABORATORY FILE COPY

CC-Messrs.
R. F. Christensen
E. W. Kellgren
P. L. Hedrick
W. O. Olson
D. M. Scott
H. J. Tierney

March 18, 1946

Mr. T. R. Orme
Bakelite Corporation
230 North Michigan Avenue
Chicago 1, Illinois

Dear Mr. Orme:

During your recent visit with Messrs. Sharp and Hallis you indicated that your company would be willing to calendar special films for us. We now wish to take advantage of your offer.

We would like to get about 500 pounds of .006" calendered film in 24" width having the following composition.

70 parts VYNW
20 parts Paraplex G-25
10 parts Dioctyl Phthalate
2 parts Calcium Stearate (or the proper amount of any other stabilizer you prefer)

This film will be quite easily stretched so we ask that you make an effort to give it to us in an unstretched condition.

Could you give us an indication of the price on this film at this time?

Yours very truly,

MINNESOTA MINING & MANUFACTURING COMPANY

W. E. LUNDQUIST
Director
Research and Development
TAPE DIVISION

WEL:vk
Mr. T. W. Sharp.

Plaintiff's Holton Exhibit 12

Minnesota Mining
v. Sears Roebuck
C. A. 878-G October 26, 1955

SALES AND ADVERTISING EXPENSE, 1945 to 1953; inclusive, on "SCOTCH" Brand pressure-sensitive, stretchable and retractable vinyl plastic tape.

	Net Sales in United States After credits for returns (in dollars)	Advertising Expenses (in dollars)	Advertising Expense % of Sales
1945	8,270.19		
1946	94,578.23		
1947	610,317.86	6,022.23	1.0
1948	1,487,018.69	31,786.73	2.1
1949	2,361,946.10	56,494.81	2.4
1950	3,927,975.85	68,702.76	1.7
1951	5,868,071.09	109,247.20	1.9
1952	7,433,933.38	108,637.29	1.5
1953	8,712,744.75	118,826.74	1.4

R. V. Holton

Plaintiff's Holton Exhibit 13-B

GENERAL ELECTRIC
SUPPLY CORPORATION

Wabash 5454

845 South Clinton St.
Chicago 7, Ill.
August 25, 1947.

SUBJECT: #33 SCOTCH ELECTRICAL TAPE.

Gentlemen:

For the first time in fifty years a revoluntionary electrical Tape is on the market ready for immediate delivery.

This new tape answers the purpose of Friction and Rubber Tapes—all you have to use is the #33 SCOTCH ELECTRICAL TAPE and one roll does the work of one roll of friction and two rolls of rubber tape. A tremendous time saver and a big improvement in many other ways.

The attached brochure describes the electrical characteristics of #33 SCOTCH ELECTRICAL TAPE, also shows some everyday applications. Read this carefully.

We have already disposed of over 10,000 rolls of this tape in Chicago. The following prices are in effect:

12 Roll Lots	$1.25 per roll
48 Roll Lots	1.20 per roll
140 Roll Lots	1.11 per roll
576 Roll Lots	1.05 per roll
1152 Roll Lots	.99 per roll

If you haven't tried #33 SCOTCH ELECTRICAL TAPE send us an order for twelve rolls. If you have tried it and want more, just fill in the order form below, mail it in and we will make immediate shipment.

Very truly yours,
/s/ A. J. Lutz
A. J. Lutz
Manager Supply Sales Division

GENERAL ELECTRIC SUPPLY CORPORATION,
845 SO. CLINTON STREET,
CHICAGO, ILLINOIS

PLEASE SHIP____ROLLS #33 SCOTCH ELECTRICAL TAPE.

Name_____

Date_____ Address_____

Shalita Exhibit 3-E (New York Depositions)

TECHNICAL TAPE CORPORATION

TO: All Salesmen
FROM: Marc L. Lawson
SUBJECT: Direct Mail Promotion — Vinelectric Tape

Attached please find specimen copy of a forceful promotional mailing piece now being received by all potential vinyl electric tape users throughout the United States. When reply cards are received from users they will be turned over to each of you for follow up and for placement through distribution.

We shall like your prompt attention to these leads so that we may fill all orders promptly.
You will be notified of other mailings as soon as they are ready for release.

Vinelectric Plastic Tape is the most important contribution made in the electrical field in 30 years — Let's get our share of new business.

M. L. Lawson /s/ Marc L. Lawson
11/21/51

chloride plasticized with a copolymer of butadiene and acrylonitrile provided on one side with a coating consisting of a solution of a polymer of isobutylene having an average molecular weight of approximately 100,000 and having a coating of pressure sensitive adhesive superposed on said first-named coating, the latter providing a non-offsetting bond between the adhesive and the backing strip, said pressure sensitive adhesive comprising substantially equal parts of a polymer of isobutylene having an average molecular weight of approximately 100,000, a polymer of isobutylene having an average molecular weight of approximately 12,000 and an ester of hydrogenated rosin acid.

8. A pressure sensitive adhesive tape comprising a backing strip of polyvinyl chloride plasticized with a copolymer of butadiene and acrylonitrile, the acrylonitrile content of the copolymer comprising from 18% to 35% thereof, said backing strip being coated on one side with a toluene solution of a polymer of isobutylene having an average molecular weight of approximately 100,000, and having a coating of pressure sensitive adhesive superposed on said first-named coating, the latter providing a non-offsetting bond between the adhesive and the backing strip, said pressure sensitive adhesive comprising substantially equal parts of a polymer of isobutylene having an average molecular weight of approximately 100,000 and a polymer of isobutylene having an average molecular weight of approximately 12,000.

9. A pressure sensitive adhesive tape comprising a backing strip of stretch oriented polyvinyl chloride plasticized with a copolymer of butadiene and acrylonitrile, the acrylonitrile content of the copolymer comprising from 18% to 35% thereof, said backing strip being coated on one side with a toluene solution of a polymer of isobutylene having an average molecular weight of approximately 100,000, and having a coating of pressure sensitive adhesive superposed on said first-named coating, the latter providing a non-offsetting bond between the adhesive and the backing strip, said pressure sensitive adhesive comprising substantially equal parts of a polymer of isobutylene having an average molecular weight of approximately 100,000, a polymer of isobutylene having an average molecular weight of approximately 12,000, and an ester of a rosin acid dissolved in an aromatic solvent.

MORTIMER H. NICKERSON.

REFERENCES CITED

The following references are of record in the file of this patent.

UNITED STATES PATENTS

Number	Name	Date
2,319,959	Tierney	May 25, 1943
2,332,265	Schmidt	Oct. 19, 1943
2,439,481	Martin	Apr. 13, 1948
2,442,279	Alderfer	May 25, 1948

Excerpts from Defendants' Exhibit 68

(Letterhead of)
FISH, RICHARDSON & NEAVE
Boston 9
August 23, 1950

Mr. Morris M. Danovitch
Plymouth Rubber Company, Inc.
104 Revere Street
Canton, Massachusetts

Dear Mr. Danovitch:

In accordance with your request when you were here on August 4th, we have obtained copies of the following patents owned by Minnesota Mining & Manufacturing Company and have examined them in connection with your proposed new polyvinyl electrical tape. The patents are as follows:

Kellgren	2,410,079
Drew	2,410,053
Drew	2,236,567
Carpenter	2,030,135
Drew	2,177,627
Drew	2,156,380
Drew	2,328,066
Drew	1,954,805
Drew	1,814,132
Drew	Re 21,762
Drew	2,227,444
Kellgren et al	2,444,830
Drew	2,236,527
Kellgren	2,410,078

Drew	2,173,829
Kellgren	2,206,899

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I might add that we do not have access to patent applications which are still pending in the Patent Office. Since none of the patents listed above discloses a polyvinyl film-type tape and inasmuch as Minnesota Mining is now actively engaged in the Patent Office patent applications directed to various features of such polyvinyl resin tapes and that such applications may result in the grant of patents on this subject matter in the future. That is a risk which cannot be avoided. Even if a patent should eventually issue, you incur no liability for infringement prior to the actual date of issue.

Very truly yours,

/s/ E. T. LeGates

Excerpts from Defendants' Exhibit 42 (Philadelphia Depositions)

Paper given before American Chemical Society
"Resinous Plasticizers Derived from Sebacic Acid"
1944

Certain of the polyesters combine to a remarkable degree the good qualities of the plasticizers of both broad classifications. An additional advantage is the possibility of their being "tailor-made" to meet predetermined requirements by adjusting the molecular weight level and by proper choice of raw materials.

Excerpts from Defendants' Exhibit 50 (Philadelphia Depositions)

"Plasticizers — Paraplex — Monoplex"
Rohm & Haas Company, 1954

INTRODUCTION

The resourcefulness and growth of modern chemical technology are perhaps nowhere better illustrated than in the diversity and quantity of plastic materials which have been offered to industry in recent years. Of these, few have shown more spectacular gains than the vinyl resins and their plasticizers.

This position of vinyl products at the forefront of the plastics industry has arisen, at least in part, because of improvements in plasticizers. Manufacturers of vinyl products, having thus been given incentive to develop higher quality materials and new uses have, in turn, set increasingly higher standards for the entire industry. Research investigators, therefore, focused their efforts on tailoring plasticizers to meet specific, often stringent, application and process requirements. The final result? Compounders of vinyl products are now able to choose from a variety of plasticizers ranging from simple monomeric esters to complex, high molecular weight polymers, such as the Paraplex series of polyesters. Rohm & Haas plasticizers, for example, can be employed alone or in combination with one another to meet — and even to exceed — virtually every demand made upon them, both in processing or service. No compounder, today, need lack for a plasticizer or plasticizer combination adaptable to his processing equipment or to the type of product he wishes to produce.

• • • • • • • • • •

Electrical Tape

The requirements for electrical tape are very critical because of the need for a combination of good electrical properties, resistance to migration into the rubber-based adhesives employed, and freedom from exudation on exposure to high humidity.

The electrical tape field has expanded rapidly over the past few years. Its future growth, however, will depend to a large extent upon the maintenance of high quality standards necessary for satisfactory performance in service. In general, only polymeric plasticizers should be considered for formulations for electrical tape, largely because of the danger of migration.

Excerpts from Defendants' Exhibit 25

"Plasticizers for Use With Polyvinyl Chloride and Copolymers"
Rohm & Haas Company, 1946

It will be noted that the formulations discussed herein, in most cases, involve the use of only one plasticizer. This does not mean to imply that binary or ternary systems are not to be considered. Commercial practice has proven that, in many systems, the use of a "compatibilizing" plasticizer will make possible the use of one showing desirable properties, or reduced cost, which otherwise could not be used. A complete study of such binary or ternary systems, however, is not within the scope of this booklet, but it is expected that more complete data thereon will be made available in the future.

Excerpts from Defendants' Exhibit 12

(St. Paul Depositions)

Period Ending
October 15, 1944

TO: DR. H. N. STEPHENS
Research Department
Adhesive Section

Semi-Monthly Report

• • • • • • • • • • •

(Page 4)

AR 42—Elastic Plasticizers—Dr. W. E. Lundquist and Esther Eastwold

Two solutions of Vinylite VYNS, one containing 33% Paraplex G25 based on the PVC, and the other in addition to the plasticizer containing 133% Titanox on the PVC, were each coated on cellophane in the Tape Lab. The pigmented film was too short for use, while the other was a clear, satisfactory film which will be coated with adhesive and made into tape rolls.

Blends of Geon latex and polyethyl acrylate emulsion have been treated with thickeners and films cast. Satisfactory films have not yet been produced.

A film consisting of Vinylite VYNS, Paraplex G25, and dioctyl phthalate (72:18:10) was produced on the calendar for the Electrical Tape Lab. The film calendered easily and was clear. Its strength was as great as that of a comparable film made of Vinylite VYNW. Standard GRS adhesive has been coated on the film and comprehensive tests are under way to determine if the plasticizer will affect the adhesive. Two substantially polyvinyl chloride polymers of

relatively low molecular weight, Vinylite VYHH and VYLF, have been plasticized in solution of methyl ethyl ketone with each of DOP, TCP and PG25. The films were not considered satisfactory, because of low tensile strength.

* * * * * * * * * * *

/s/ J. O. HENDRICKS 10-24-44
Adhesive Research Laboratory

Excerpts from Defendants' Exhibit 2

(St. Paul Depositions)

(Handwritten)

"89575 D

1300 g.	VYNS	72
324 g.	PG25	18
180 g.	DOP	10
39 g.	Ca Stearate	3

Milled at 300° F without discoloration.
Calendered 220° F on to varnished cloth liner.
Given to Ralph Oace."

Excerpts from Defendants' Exhibit 10

EXPERIMENT
TAPE DEPARTMENT

(2) Electrical Tape

EXPERIMENTAL PRODUCTION REPORT
PSL-9556 January 17, 1945

SUBJECT: Vinyl Chloride - Vinyl Acetate Film for Electrical Tape.

OBJECT: Production of pressure sensitive moldproof and waterproof tape.

PROCEDURE:

Vinylite (V.Y.N.S.) will be compounded, calendered, and coated in production.

ATTENTION: Rubber Compounding Department

Lots 1—PSL-9556:	137.00#	V.Y.N.S.
	39.20#	Paraplex G-25
	20.40#	Dioctyl Phthalate-(D.O.P.)
	4.30#	Calcium Stearate
	200.90#	

PROCEDURE:

Mix V.Y.N.S. and calcium stearate together; then add Paraplex G-25 and Dioctyl Phthalate (D.O.P.) mixing thoroughly, and adding to the 60" mill with maximum heat applied, to the rolls for the 15 minute warm-up.

Batch should be milled thoroughly for approximately one hour and small portions supplied to the production calender while still hot. (Call Author while Milling—Extension No. 338)

ATTENTION: RUBBER COMPOUNDING (Calendering)

Sheet the milled base to .006 caliper, winding onto a varnish cloth liner (Varnoseal). Use maximum temperatures on top and center rolls, and keep the bottom roll cold. Knife setting should be 19".

ATTENTION: TAPE COATING DEPARTMENT

Please coat all the material made up from the above calender and mill batch as follows:

Schedule on a 28" machine which has a primer tank and steam drum attachment.

Backing: Calendered ~~V.Y.~~N.S. (Vinylite)

The backing will have a varnish cloth liner, used as a carrier, and the vinylite side should be coated at 7 grains per 4x6.

Primer: P-34

Adhesive: A-341 (7 grains)

Oven Temperatures: top — 110° — 115°F
Center — 135° — 145°.F

The center temperature should be increased to avoid bubbling if the material is not dry.

Speed: 5 yards per minute

Liner: RP-124

ATTENTION: TAPE SLITTING DEPARTMENT

Refer to SL-9644. Use the vinylite slitting technique.

Call Author before slitting. (Extension 338).

Rolls should be wound on 1" cores x 36 yards.

50% of material slit at ¾"
25% of material slit at ½"
25% of material slit at 1"

RBS/ldf

Robert B. Snell